DATACOM TEXTRON

LANcat Series

Cable Testers

User Manual

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WARRANTY STATEMENT

The LANcat is warranted against defects in materials and workmanship within a period of two (2) years following the date of purchase of the tester.

Any instrument claimed to be defective during the warranty period should be returned to Datacom Textron's Factory Service Center. Refer to the chapter on Technical Support and Service for further instructions.

ANY IMPLIED WARRANTIES ARISING OUT OF THE SALE OF A LANCAT CABLE TESTER, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO THE ABOVE STATED TWO (2) YEAR PERIOD. DATACOM TEXTRON SHALL NOT BE LIABLE FOR LOSS OF USE OF THE TESTER OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES, EXPENSES OR ECONOMIC LOSS.

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Datacom Textron certifies that this instrument was thoroughly tested and found to meet its published specifications when shipped from the factory.

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1. INTRODUCTION

The LANcat Series are precision instruments for the certification and troubleshooting of LAN cable installations.
With plug-in Performance Modules, the LANcat Series are capable of testing a wide variety of cable types including
Category 5/Class D twisted pair, coaxial cable, and fiber optic cable.

This User Manual covers two LANcat Series model configurations. All models are fully compliant with the testing requirements of the TIA/EIA 568A TSB-67 and provide Level II measurement accuracy when testing Category 5 Basic Links.

LANcat OneWay. The OneWay System performs one way near-end crosstalk (NEXT) measurements up to 100 MHz. Testing of NEXT from both ends of the link, as now required by TIA TSB-67 for compliant Category 5 installations, is accomplished by completing separate tests from each end. The test system includes a main handheld unit and an Active Remote (also called OneWay Remote).

LANcat TwoWay. The TwoWay System performs automatic bi-directional measurements of NEXT up to 100 MHz. The test system includes two LANcat TwoWay handheld units, each having a full graphic display and control panel. Either unit may be operated as a main or a remote unit for testing twisted pair links.

Overview of Features

The features and functions of the LANcat include:

TESTING FEATURES

- OneWay or TwoWay system testing.
- Tests UTP, ScTP, coaxial, STP, and fiber optic cable.
- Certifies twisted pair cable up to EIA/TIA 568A Category 5 and ISO/IEC 11801 Class D (100 MHz).
- Performs NEXT, Length, Wire Map, Attenuation, Noise, Traffic, Impedance, and Resistance tests
- Performs a preprogrammed suite of certification tests when set to Autotest.
- Performs enhanced cable tests including Power Sum NEXT, Delay/Delay Skew, and Cable Grading to test emerging new enhanced data cables.
- Cable Toner enables identification of cable at far end.

PRODUCT FEATURES

- Stores up to 500 Autotest results on a OneWay System, or 1000 for a TwoWay System.
- Graphical user interface on the main and remote units allowing test results to be viewed at both ends.
- Backlit LCD display.
- Easy field updates of hardware and software using plug-in Performance Modules and flash memory.
- Operates using either replaceable AA batteries, AC/Mains power, or a rechargeable NiMH battery pack (optional).
- Voice communication between main unit and the remote (LANcat TwoWay).

The features of the LANcat, and how they are used, are briefly described in Figure 1-1.

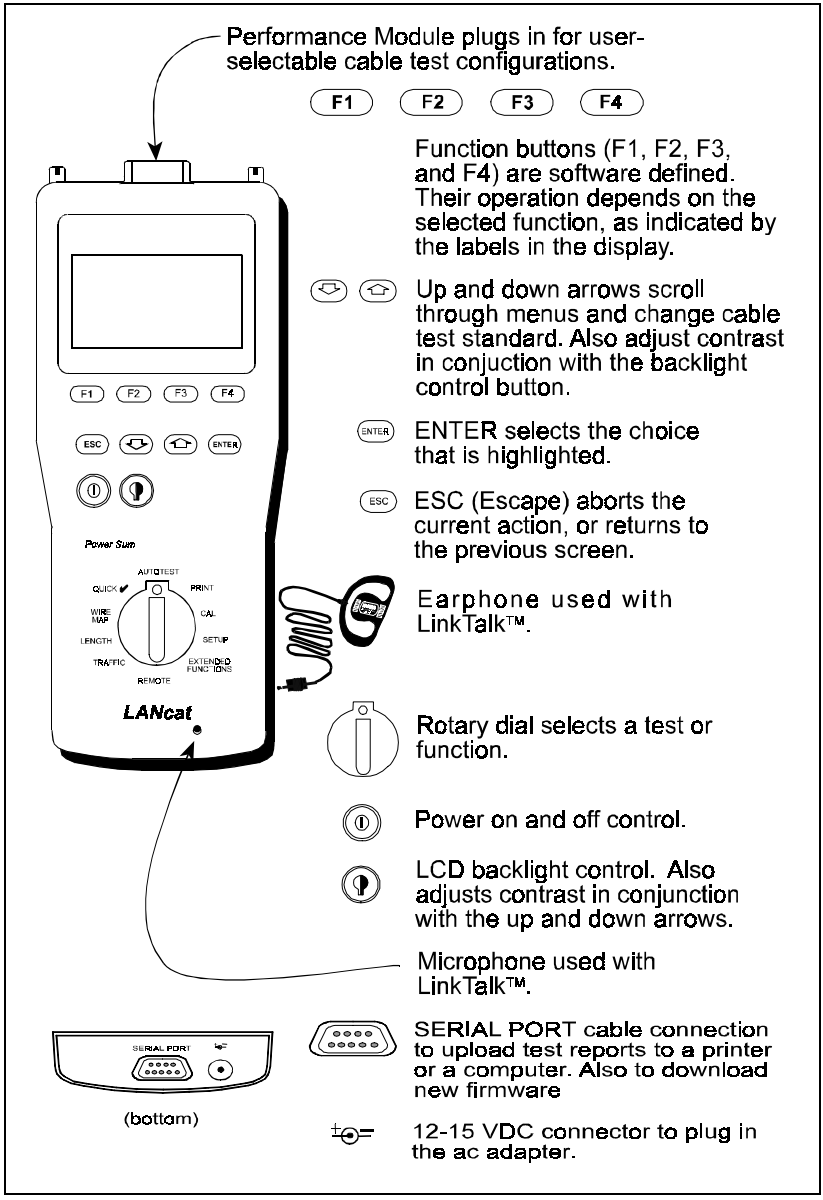


Figure 1-1. LANcat Overview of Features

Tests and functions accessible using the rotary dial are described in Figure 1-2.

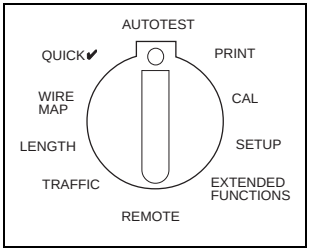
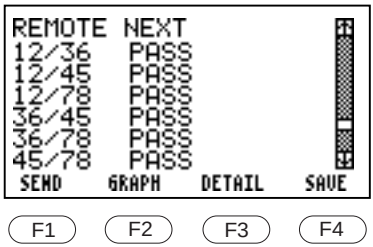


Figure 1-2. Function Dial

Dial Position	Function
AUTOTEST	Performs a preprogrammed suite of tests, which are required to certify a cable installation.
PRINT	Print, view, or upload to PC, Autotest and/or Traffic reports.
CAL	Calibrate cable NVP, Performance Module and Remote.
SETUP	Changes operation characteristics including Time/Date.
EXTENDED FUNCTIONS	Individual cable tests, unit selftest, pair reversal test, repeatability test and flash memory download.
REMOTE	Puts LANcat into remote mode, for use in TwoWay testing
TRAFFIC	Monitors traffic activity on an Ethernet network.
LENGTH	Determines the cable length and up to two intermediate anomalies.
WIRE MAP	Determines pin-to-pin continuity, shield continuity and split pairs.
QUICK ✓	Performs an abbreviated Autotest test sequence as a fast cable installation check.

SEND FUNCTION (TWO-WAY SYSTEM)

A Send function is available with the LANcat TwoWay System. This function allows you to transmit on-screen test results to the unit at the other end. To use the Send function, simply complete the test, and when the screen you want to transmit is displayed, press the corresponding soft function key. For example, in the figure below, you would press F1 to send the results.



LINKTALK™ FUNCTION (TWO-WAY SYSTEM)

The LinkTalk™ function is available with the LANcat TwoWay System. This function allows two way voice communication between the main unit and the remote. LinkTalk™ uses a microphone embedded in the front of each unit and an earphone connected to the jack located on each unit's side. See Chapter 3, AutoTest, for details.

PERFORMANCE MODULE

The LANcat is designed with removable performance modules for attaching to various cable types and cable connectors. The key to the LANcat's high measurement accuracy is using the proper performance module.

To remove a module, loosen the thumbscrews at either side of the module until the screws are free of the retainers. Hold the module on either side and slide it out of the opening (refer to Figure 1-3). To install a module, slide it into the opening until the screws rest against the retainers, then hand-tighten the screws until the module is properly seated.

CAUTION

Avoid damaging the case of the LANcat. Tighten the screws evenly using finger pressure only. Make sure to either turn both screws simultaneously or alternately in small increments. The module is designed to be installed or removed without tools.

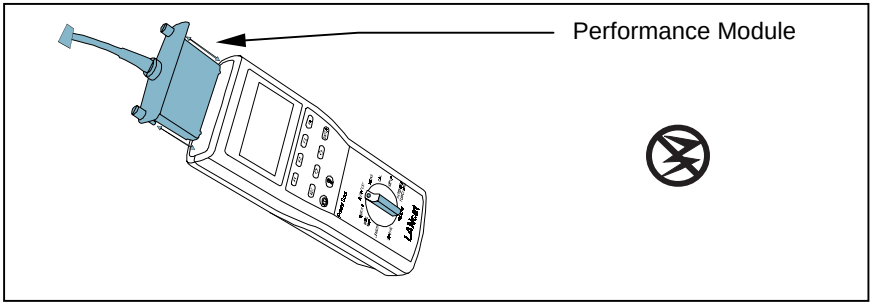


Figure 1-3. Module Removal

STATIC AWARENESS

The LANcat contains static sensitive electronics inside the main body. Use appropriate precautions when removing and installing performance modules.

REMOTE UNIT (ONE-WAY SYSTEM)

The Remote Unit is connected at the far end of the cable when testing twisted pair cable. The Remote Unit (see Figure 1-4) is used during NEXT, Attenuation and Wire Map tests.

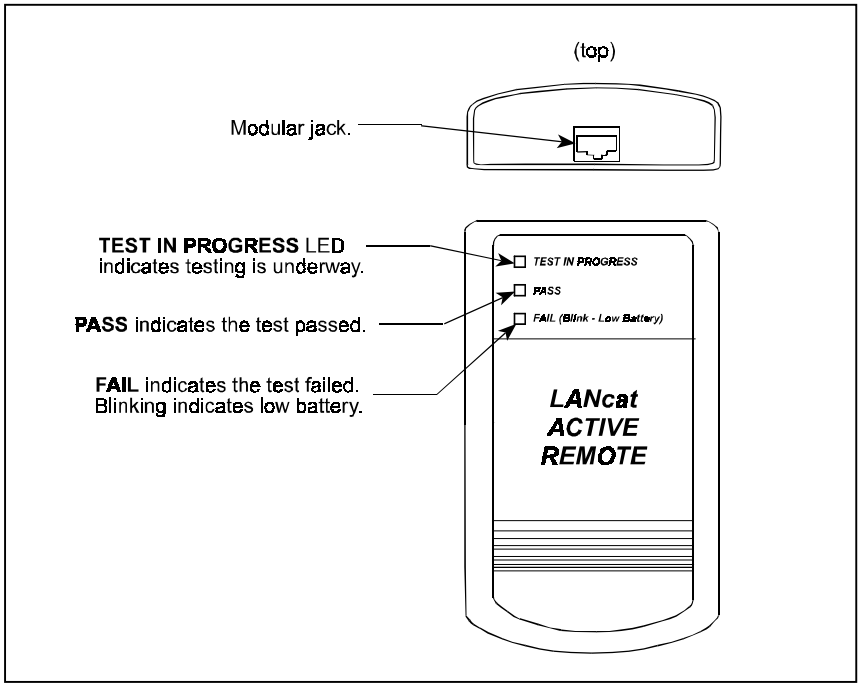


Figure 1-4. Remote Unit

Battery Information

The LANcat handheld is shipped with eight AA alkaline batteries. The Remote Unit is shipped with four AA alkaline batteries.

An optional rechargeable nickel metal hydride (NiMH) battery pack may be ordered for the LANcat handheld.

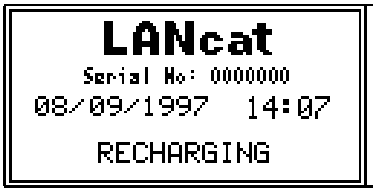
A low battery message displays on the LCD screen when it is time to replace the batteries. When the low battery message appears, you have 60 seconds to save your test results before power-down occurs.

MEMORY STORAGE

The LANcat memory is powered from an internal, long-life lithium cell. Stored test results and set up conditions will therefore be saved when you replace the AA alkaline batteries or rechargeable battery pack.

CHARGING MODE

When the AC/mains adapter is used and the LANcat is powered "off", the unit goes into a "sleep mode." With the optional NiMH rechargeable battery pack installed, the unit goes into a Recharge mode. A fully discharged battery pack will take approximately 10-12 hours to charge to full capacity. To resume testing, press the Power button.



CHANGING THE BATTERIES

To change the batteries in the LANcat:

1. Remove the battery compartment cover, located on the back of the instrument (refer to Figure1-5).
2. Remove the batteries.
3. Install new batteries paying attention to the polarity markings on the inside of the battery well.

NOTE

The FAIL LED on the Remote Unit blinks continuously when the battery is low.

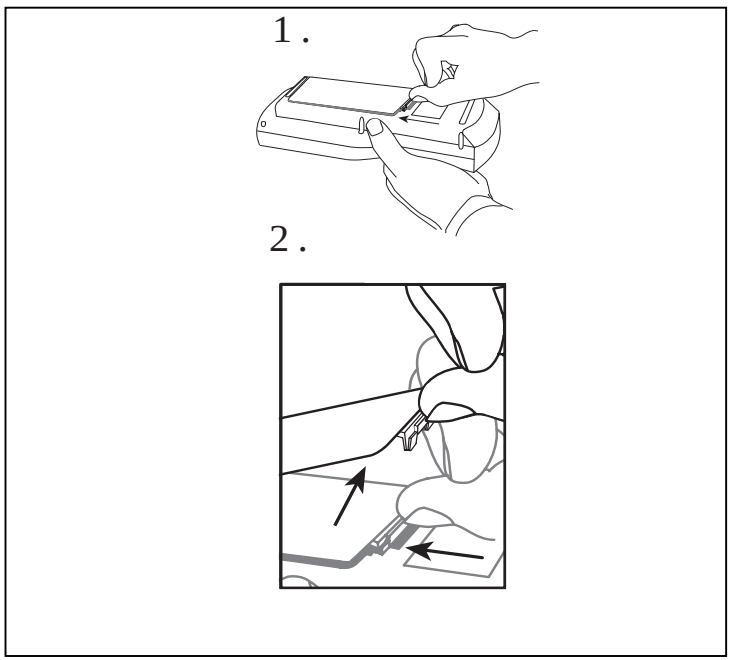


Figure 1-5. Battery Replacement

Display Conventions

ARROW KEYS

An up/down arrows symbol ↓↑ (see detail in Figure 1-6) appears next to an item on the LCD display to indicate that you can use the arrow keys to make a different selection. For example, in the figure below, the arrows appear next to the word “Link” on the screen.

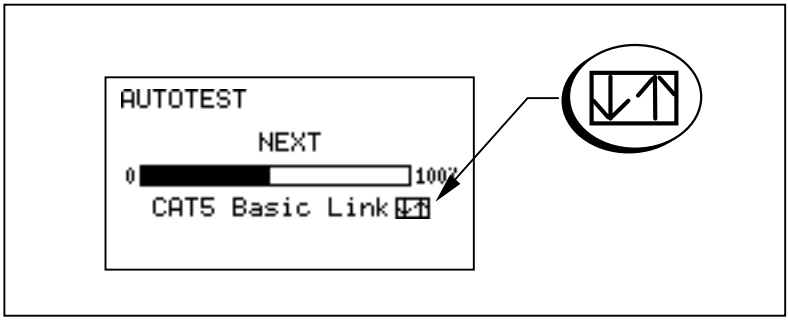


Figure 1-6. Arrows Symbol

To change a selection:

1. Press the up or down arrow keys to scroll through the available selections.
2. When the choice you want is highlighted, press SAVE (F4) or ENTER.

SCROLL BARS

When there are more selections available than can fit on one LANcat screen, scroll bars will appear. For example, in the figure below, the scroll bar appears above “Save.”
To use the scroll bar, use the arrow keys to move the scroll-bar indicator as well as to highlight a new selection.

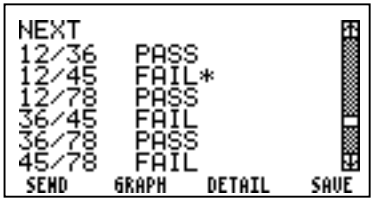


Figure 1-7 Sample of Scroll Bar

DISPLAY CONTRAST ADJUSTMENT

To adjust the screen contrast, hold down the Backlight button and press the arrow keys to set the screen contrast for comfortable viewing.

2. GETTING STARTED

This chapter provides a brief overview to the use of the LANcat for testing twisted pair cabling. It is intended for those users with prior cable testing experience who want to get started quickly. It covers only the basics on initial instrument set up, connections to the cable and the Autotest function. LANcat users with no prior cable testing experience are advised to also review Chapter 7, Testing Twisted Pair Cabling before using this instrument.

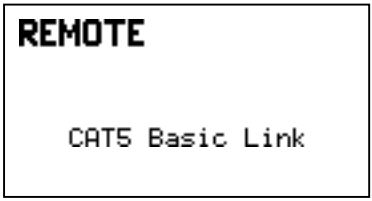
Initial Instrument Set Up

Before you first use the LANcat, you should check SETUP, which controls many basic instrument operations such as power-down time, backlight “on” time, feet/meters, date, time and serial output format. Each of these settings, however, has a “default” value established by the factory. To adjust any of these settings, refer to Chapter 8, Set Up.

SETTING UP THE LANCAT TWO-WAY SYSTEM

To set up the LANcat TwoWay System:

1. Set the remote unit's dial to REMOTE.
2. Press the remote unit power button on. The display will read



3. Set the main unit's dial to the test or function you want to perform.
4. Connect the cable.
5. Press the main unit's power button on.

SETTING UP THE ONE-WAY SYSTEM

To set up the LANcat OneWay System:

1. Set the LANcat's dial to the test or function you want to perform.
2. Connect the cable.
3. Press the LANcat's power button.

NVP CALIBRATION

In order to make accurate cable length measurements, the correct cable NVP value must be set in the LANcat. A typical NVP value will be automatically selected by the LANcat depending on the test standard that you choose. For greater measurement accuracy, follow the NVP calibration procedure in Chapter 9, Calibration.

Why do I need to set cable NVP?

In order to make accurate cable length measurements, the correct cable Nominal Velocity of Propagation (NVP) value must be set in the LANcat. The NVP is a measure of how fast an electrical pulse travels down a cable compared to the speed of light.

NVP is expressed as a percentage and is usually between 50% and 90%. A default NVP value is automatically set by the LANcat based upon the cable test standard selected.

Using the default value, however, may result in cable length measurement errors of up to 7% due to the variation in the signal propagation rate from cable to cable. This potential length error usually will not impair troubleshooting of a prior working cable segment unless the length measurement of a cable is close to the test limit (for example 100 meters on a 10BASE-T segment).

When using the LANcat for cable certification, determine the true cable NVP and save the value. This will ensure the most accurate cable length measurements and will avoid failing cable segments that are close to the test limit.

Typical Test Set Up

BASIC LINK TESTING

Figure 2-1 illustrates a typical test set up using a TwoWay System to test a Basic Link, as defined by TIA/EIA TSB-67.

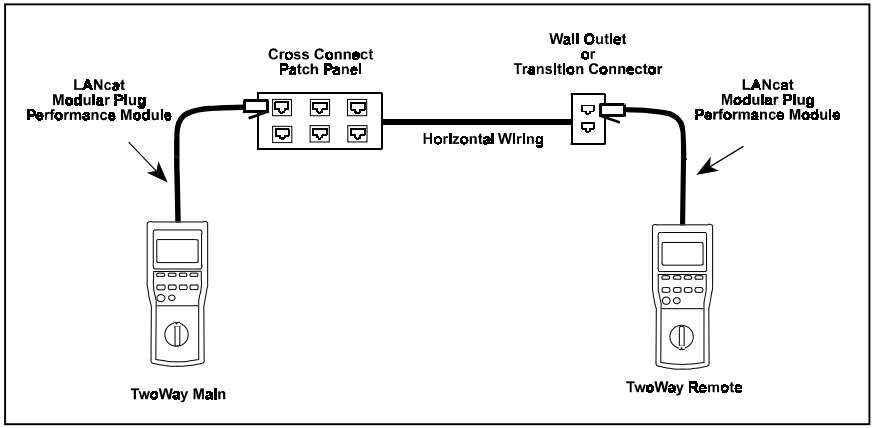


Figure 2-1. Typical TwoWay Test Set Up For Testing a Basic Link

Figure 2-2 illustrates a typical test set up using a OneWay System to test a Basic Link as defined by TIA/EIA TSB-67.

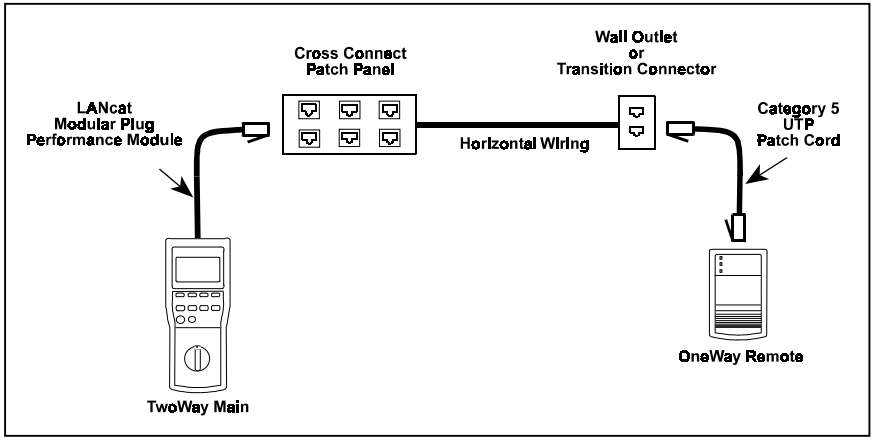


Figure 2-2. Typical OneWay Test Set Up For Testing a Basic Link

NOTE

To certify a cable link with Level II accuracy, you must test the Basic Link using the LANcat Modular Plug Performance Module. You must also test the link from both ends (LANcat OneWay only). See Appendix A, Test Standards for further information.

CHANNEL TESTING

Figure 2-3 illustrates a typical test set up using a TwoWay System to test a Channel as defined by TIA/EIA TSB-67.

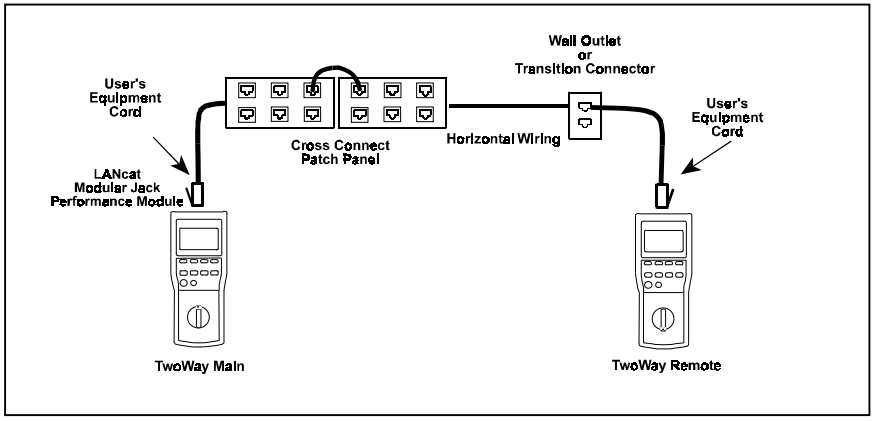


Figure 2-3. Typical TwoWay Test Set Up For Testing a Channel

Figure 2-4 illustrates a typical test set up using a OneWay System to test a channel as defined by TIA/EIA TSB-67.

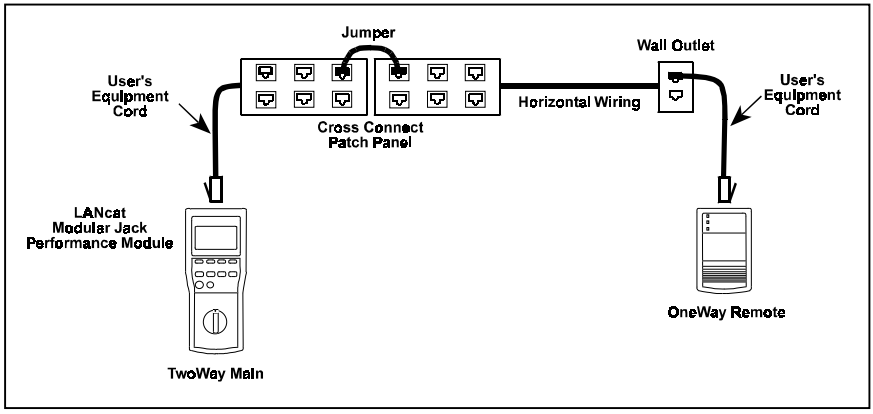


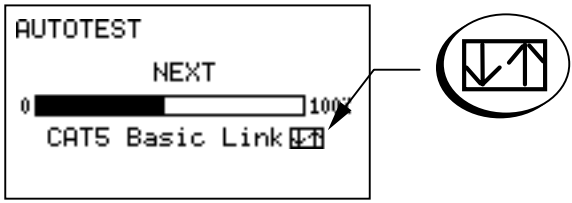
Figure 2-4. Typical OneWay Test Set Up For Testing a Channel

NOTE

A channel can be certified for conformance to the TIA/EIA TSB-67 Link Performance Standard, however, accuracy will be less than Level II requirements. See Appendix A, Test Standards for further information.

Selecting a Cable Test Standard

The Cable Test Standard used by the LANcat to certify cables may be changed any time ↓↑ appears next to the cable name.



To select a different cable test standard:

1. Set dial to Autotest, Quick ✓, Wire Map, Length or Traffic.
2. Press either arrow key to display the cable standard library and select a different cable test standard.
3. When the desired cable test standard is highlighted, press SELECT (F4) or ENTER. The LANcat immediately begins testing using the new cable test standard.

NOTE

Refer to Appendix A, Test Standards, for assistance in choosing an appropriate cable test standard.

When using a TwoWay System, cable standards are compared at both ends. If they differ, the standard on the Remote end will automatically be changed to match that of the Main end.

System Integrity Pre-Test

Before testing an installation, the integrity of the LANcat system may be checked by running the tests described below.

To pre-test your system:

1. Connect the main and remote units using a CAT3 coupler or a patch cable.
2. Run Self Test (Extended Functions, see Chapter 11).
3. Run Pair Reversal (Extended Functions, see Chapter 5).
4. Run Repeatability (Extended Functions, see Chapter 5).
5. Run Autotest (CAT3 Basic Link, see Chapter 3).
6. If FAIL occurs on any test results, contact Datacom Textron Technical Support for assistance (see Chapter 11).

3. AUTOTEST

Autotest is a preprogrammed suite of tests which are required to certify a cable installation.

- **Wire Map**
- **Near-End Crosstalk (NEXT) at both ends for TwoWay testing**
- **Attenuation**
- **ACR**
- **Length**

The following tests may be added to the Autotest suite of tests by defining a Custom Cable standard (see Appendix A, Defining Custom Standards):

- **Impedance**
- **Delay / Delay Skew**
- **Power Sum NEXT**
- **Cable Grading**
- **Resistance**

Refer to Chapter 5, Cable Test Descriptions, for a complete description of these and other tests performed by the LANcat.

Refer to Chapter 6, Printing, Uploading and Viewing Test Results, for more information about printing test results and uploading test results to a PC.

Running Autotest

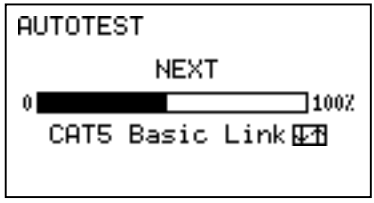
TWO-WAY SYSTEM

1. Connect one end of cable to the main unit and the other end to the Remote Unit.
2. Set the Remote Unit's dial to REMOTE.
3. Set the Main Unit's dial to AUTOTEST. The test runs automatically, then displays the results.(Press the arrow keys to change the cable test standard).
4. Press START (F1) to re-start Autotest. Press VIEW (F3) to review Autotest test results.
5. Press SAVE (F4) or ENTER to save the Autotest test results.
6. Press TALK (F2) to ring the Remote Unit at the other end.

ONE-WAY SYSTEM

1. Connect one end of cable to the LANcat and the other end to the Remote Unit.
2. Set dial to AUTOTEST. The test runs automatically then displays the results. (Press the arrow keys to change the cable test standard).
3. Press START (F1) to re-start Autotest. Press VIEW (F3) to review Autotest test results.
4. Press SAVE (F4) or ENTER to save the Autotest test results.

Running Autotest



F1 F2 F3 F4

Autotest Results

F1 F2 F3 F4

NOTE

If the LANcat fails any test, it will stop and display the failure. You may continue testing by pressing the CONTINUE (F4) softkey.

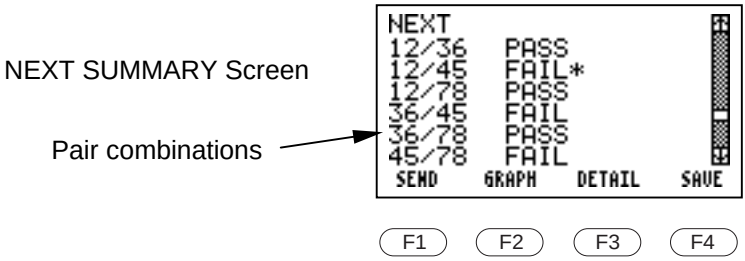
Viewing Autotest Results

Autotest results are displayed in either summary or detailed mode.

This section describes a general procedure for reviewing Autotest results including summary screens for Wire Map, NEXT, Attenuation, ACR, Length and Propagation Delay tests, and detailed test results for NEXT and Attenuation. Refer to Chapter 5, Cable Test Descriptions for further information on interpreting test result screens.

SUMMARY RESULTS

1. Press VIEW (F3) from the Autotest results screen.
2. Press the arrow keys to view additional summary test result screens.
3. Press SAVE (F4) or ENTER at any time to save the Autotest results.
4. On a TwoWay System, press SEND (F1) to send the results to the Remote Unit.
5. Press ESC to exit View.



NOTE

If you are using a TwoWay System, the Send function appears above the F1 key. Press F1 to send the information to the remote end.

Marginal Test Results

A PASS* or FAIL* result indicates that a measured NEXT or attenuation value is close enough to the Test Standard that it is within the measurement uncertainty of the LANcat. As a result, the PASS or FAIL judgment is uncertain, and therefore the LANcat can not determine with confidence that the link conforms to the Test Standard.

The following steps may be taken in order to resolve link tests with marginal measured results:

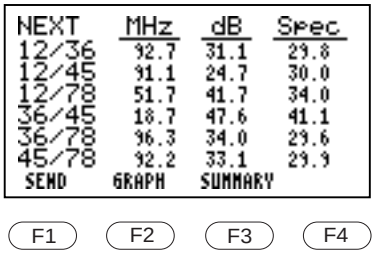
1. Reduce the measurement uncertainty. If you are currently using a Level I-rated Performance Module (PM), replace it with a Level II-rated PM and retest. If the test result is still marginal, or if you are already using a Level II-rated PM, proceed to the next step.
2. Recheck the link installation, focusing on connection points. Refer to Chapter 7, Testing Twisted Pairs, for suggestions on causes for excessive NEXT and attenuation. Correct installation if possible, and retest.

DETAILED RESULTS

Some test results screens have a DETAIL softkey that you can press to view more information about the test results (e.g., NEXT summary screen).

1. Press DETAIL (F3) from the Autotest results screen.
2. Press SUMMARY (F3) to return to the test result SUMMARY screen.
3. Press SAVE (F4) or ENTER at any time to save the Autotest results.
4. For a discussion of GRAPH (F2), refer to Chapter 5, Cable Test Descriptions, Viewing NEXT Graph Results.
5. On a TwoWay System, press SEND (F1) to send results to the Remote Unit.

NEXT DETAIL Screen



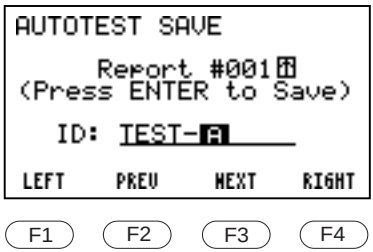
Saving Autotest Results

The LANcat can store the results of up to 500 Autotests, which can later be uploaded to a PC or printer. Refer to Chapter 6, Printing/Uploading Test Results, for the discussion on how to output test results.

To save Autotest results:

1. Press SAVE (F4) or ENTER, from the Autotest Summary screen or any VIEW screen. The LANcat automatically selects the next report number. You can change the number by pressing the arrow keys.
2. If desired, enter a circuit identification number (refer to the detailed instructions that follow).
3. Press ENTER.

Saving Autotest Reports



NOTE

On a TwoWay System, either unit may save up to 500 Autotests, giving the TwoWay System the capability of saving 1000 Autotests. This is accomplished by reversing the roles of the handhelds.

CAUTION

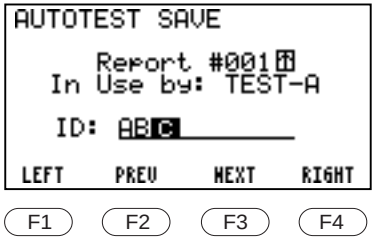
If you choose a report number that is in use, LANcat beeps and displays the message “In Use” beneath the report number.

The LANcat has no overwrite protection. Nothing prevents you from saving a report to the same number as a previous report number and erasing the earlier one.

Entering A Circuit Identification Name

To change circuit identification:

1. The LANcat will display a default circuit identification unless disabled by the Setup routine. To speed up entering circuit identifiers, the LANcat can automatically increment the last circuit identifier. (Refer to Chapter 8, Setup).
2. Press LEFT (F1) or RIGHT (F4) to move the cursor left or right along the ID line.
3. Press PREV (F2) or NEXT (F3) to enter numeric or alpha characters.
4. Press ENTER to save or press ESC to quit without saving.



After saving, a message in the upper right corner of the screen displays the saved report number (e.g., “Saved #001”).

Autotest report details remain available for viewing until the next test is started.

NOTE

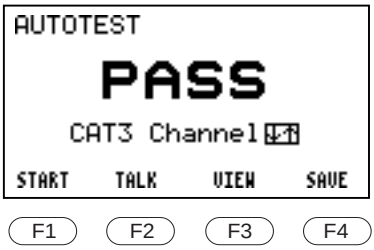
Autotest results will be lost if not saved before the LANcat powers down.

LinkTalk™ (LANcat TwoWay System)

LinkTalk™ temporarily converts the LANcat TwoWay system to an audio-communication system. LinkTalk™ enables bi-directional, one-way (half-duplex) voice communication between the main unit and the remote.

1. Attach earphones to jack on lower right side of both main and remote units.

2. LinkTalk™ can be activated following Autotest, Quick Check, or from the Extended Functions menu. Press TALK (F2) from the Autotest or Quick Check summary screen, or select TALK from the Extended Functions menu. This will cause the remote to enter the TALK mode.



3. When the remote unit enters TALK mode, an alert bell will ring. Press STOP RING (F3) or any other defined function button on the remote unit to stop the bell.

4. Press PUSH TO TALK (F4) on either the main or remote to talk to the person at the other end of the cable.

5. Press the arrow keys to adjust earphone volume up or down.

6. Press ESC to exit TALK mode.

INTERACTION OF TALK AND SEND FUNCTIONS

After sending a test result screen to the Remote using the SEND button, the TALK feature can be activated as shown below - making it easy for the operators to discuss the result.

1. From an Autotest Summary Screen, send the test result screen to the Remote using the SEND button.

2. On the Main unit, press the ESC key to return to the overall Autotest summary screen.

3. Enter the TALK mode by pressing the TALK button (F4).

4. On both units, a REVIEW (F1) softkey is displayed. Press REVIEW (F1) to view the test result screen.

5. Press PUSH TO TALK (F4) to talk to the person at the Remote end.

6. Press ESC to return to the TALK mode screen.

4. QUICK CHECK

Quick Check is an abbreviated Autotest, designed to complete in less than 10 seconds. It is useful for quick installation checks.

- **Wire Map**
- **Near-End Crosstalk (NEXT) at both ends for TwoWay testing**
- **Attenuation**
- **ACR**
- **Length**

The following additional tests may be added to the Quick Check suite of tests by defining a Custom Cable standard (see Chapter 2, Defining Custom Standards):

- **Impedance**
- **Propagation Delay / Delay Skew**
- **Power Sum NEXT**
- **Cable Grading**
- **Resistance**

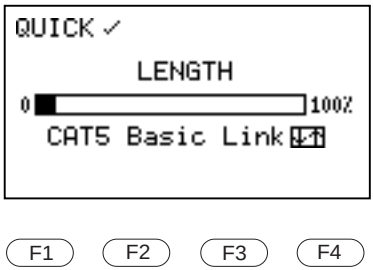
NEXT and Attenuation tests take measurements at a reduced number of test points covering the entire frequency range. For this reason, Quick Check is not a cable certification test; the results cannot be saved.

Running Quick Check

TWO-WAY SYSTEM

1. Connect one end of the cable to the main unit and the other end to the Remote Unit.
2. Set the Remote Unit's dial to REMOTE.
3. Set the main unit's dial to QUICK ✓. The test begins automatically. (Press the arrow keys to change the cable test standard).
4. Press START (F1) to re-start Quick Check. Press VIEW (F3) to review Quick Check test results.

Running Quick Check



The results of Quick Check are displayed on the screen.

Quick Check Results

ONE-WAY SYSTEM

1. Connect one end of cable to the LANcat and the other end to the Remote Unit.
2. Set dial to QUICK ✓. The test begins automatically. (Press the arrow keys to change the cable test standard).
3. Press START (F1) to re-start Quick Check.
4. Press TALK (F2) to talk to remote unit operator. (Refer to Chapter 3 for instructions in using LinkTalk™).
5. Press VIEW (F3) to review Quick Check test results.

Viewing Quick Check Results

Viewing the results of Quick Check is the same as for Autotest, except that they cannot be saved. Refer to Viewing Autotest Results in Chapter 3, Autotest.

Marginal Test Results

A PASS* or FAIL* result indicates that a measured NEXT or attenuation value is close enough to the Test Standard that it is within the measurement uncertainty of the LANcat. As a result, the PASS or FAIL judgment is uncertain, and therefore the LANcat can not determine with confidence that the link conforms to the Test Standard.

The following steps may be taken in order to resolve link tests with marginal measured results:

1. Reduce the measurement uncertainty. If you are currently using a Level I-rated Performance Module (PM), replace it with a Level II-rated PM and retest. If the test result is still marginal, or if you are already using a Level II-rated PM, proceed to the next step.
2. Recheck the link installation, focusing on connection points. Refer to Chapter 7, Testing Twisted Pairs, for suggestions on causes for excessive NEXT and attenuation. Correct installation if possible, and retest.

5. CABLE TEST DESCRIPTIONS

The following section describes each test and how to run each test individually. Refer to Chapter 7, Testing Twisted Pairs, for detailed test results interpretation and more troubleshooting tips.

While it is usually recommended to use Autotest for most cable testing, individual cable tests may be useful in troubleshooting specific cable problems.

For example, Autotest may reveal a wire map problem requiring remounting of connectors. It may be faster to use the individual Wire Map test to verify the correction and then to perform another Autotest sequence for a certification record.

Wire Map

Wire Map checks twisted pair cable for pin-to-pin and shield continuity, and checks for split pairs.

Wire Map is one of the tests run during Autotest and Quick Check. It can also be run individually.

Wire Map tests for:
- **Reversed pair**
- **Shorts**
- **Opens**
- **Crossed pairs**
- **Split pairs**
- **Miswires**
- **Shield continuity**

RUNNING WIRE MAP INDIVIDUALLY

1. Connect one end of the cable under test to the LANcat and the other end to the remote unit. If you are using a TwoWay System, set the remote unit's dial to Remote.
2. Set dial to WIRE MAP. The test begins scanning immediately. (Press the arrow keys to select another cable test standard).

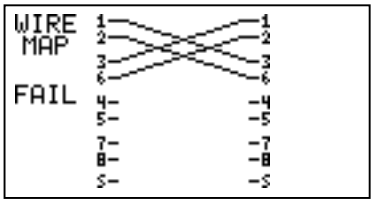
NOTE

Wire Map runs continuously to enable you to find intermittent wiring problems.

All four pairs will be tested and the results displayed even if the selected test standard does not require all the pairs to be tested. However, a PASS/FAIL determination is only based on the pairs required by the selected cable test standard.

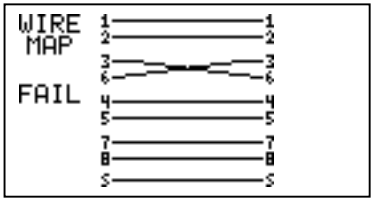
VIEWING WIRE MAP RESULTS

The results of the Wire Map test are displayed on the LANcat screen. The following illustrations show possible wiring faults.

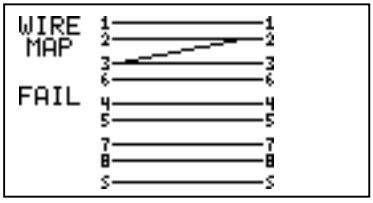


Crossed Pair

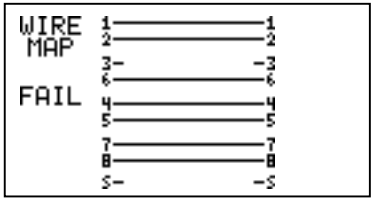
Split Pair



Reversed Pair



Short



Open

NEXT

NEXT (Near-End Crosstalk) is a measure of noise coupled between two twisted pairs measured at the same end of the cable as the disturbing signal source.

NEXT is measured using all pair combinations when testing a twisted pair cable.

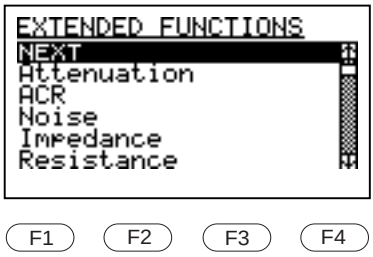
NEXT is one of the tests run during Autotest and Quick Check. It is one of the fundamental certification tests for Category 3, 4 and 5 UTP cabling. It can also be run individually as an Extended Functions test.

NEXT tests for:
- **Excessive crosstalk between pairs**
- **Proper pair connections**

RUNNING NEXT INDIVIDUALLY

1. Connect one end of the cable under test to the LANcat and the other end to the remote unit. If you are using a TwoWay System, set the remote unit's dial to Remote.
2. Set dial to EXTENDED FUNCTIONS.
3. Press ENTER (NEXT is the first selection).
4. (Press the arrow keys to change the cable test standard).
5. Press Start (F1) to restart NEXT.

Selecting NEXT



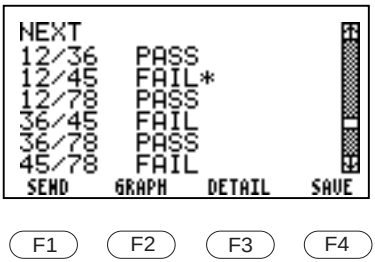
NOTE

When the NEXT test is performed on a TwoWay System, both ends are tested.

VIEWING NEXT RESULTS

The NEXT of each pair combination is compared to the selected cable test standard and pass or fail is indicated.

NEXT Summary Results

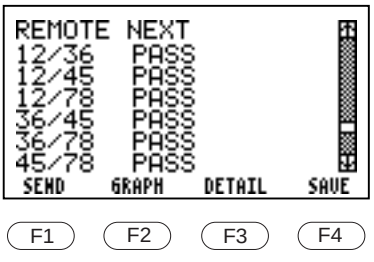


The worst measured crosstalk is shown in the detailed test display. The display indicates the frequency of this measurement, the measured value in decibels (dB) and the test limit.

To View the details of the NEXT test:

1. From the NEXT summary result screen, press DETAIL (F3).

Detailed NEXT Results



2. On a TwoWay System, press SEND (F1) to send the results to the Remote Unit.
3. Press SUMMARY (F3) or ESC to return to the summary screen.

Marginal Test Results

A PASS* or FAIL* result indicates that a measured NEXT value is close enough to the Test Standard that it is within the measurement uncertainty of the LANcat. As a result, the PASS or FAIL judgment is uncertain, and therefore the LANcat can not determine with confidence that the link conforms to the Test Standard.
The following steps may be taken in order to resolve link tests with marginal measured results:

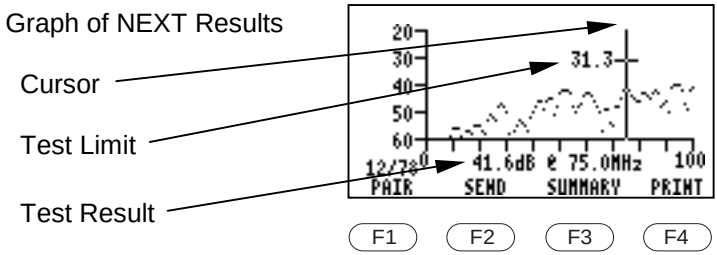
1. Reduce the measurement uncertainty. If you are currently using a Level I-rated Performance Module, replace it with a Level II-rated Performance Module and retest. If the test result is still marginal, or if you are already using a Level II-rated Performance Module, proceed to the next step.

2. Recheck the link installation, focusing on connection points. Refer to Chapter 7, Testing Twisted Pairs, for suggestions on causes for excessive NEXT. Correct installation if possible, and retest.

VIEWING A GRAPH OF NEXT RESULTS

To view a graph of the NEXT test results:

1. From the detail or Summary Results screen, press GRAPH (F2).



2. Press PAIR (F1) to display the results for a different pair combination. On a TwoWay System, press SEND (F2) to send the results to the Remote Unit.
3. Press the arrow keys to move the cursor to a new point on the graph. The test result at the selected point is displayed below the graph.
4. Press PRINT (F4) to send a comma-separated variable (CSV) listing of the results to the serial port. This outputs a complete listing of all NEXT measurements for all pair combinations.
5. Press SUMMARY (F3) or ESC to return to the Summary screen.

NOTE

The test result displayed on the graph is the worst value found within 1 MHz frequency increments for Category 5 and ISO Class D testing. All test results are available and can be output from the LANcat.

Power Sum NEXT

NEXT (Near End Crosstalk) is a measure of noise coupled from one pair to another pair within a four pair cable.

Power Sum NEXT is a sum of the pair-to-pair NEXT coupled from all adjacent pairs.

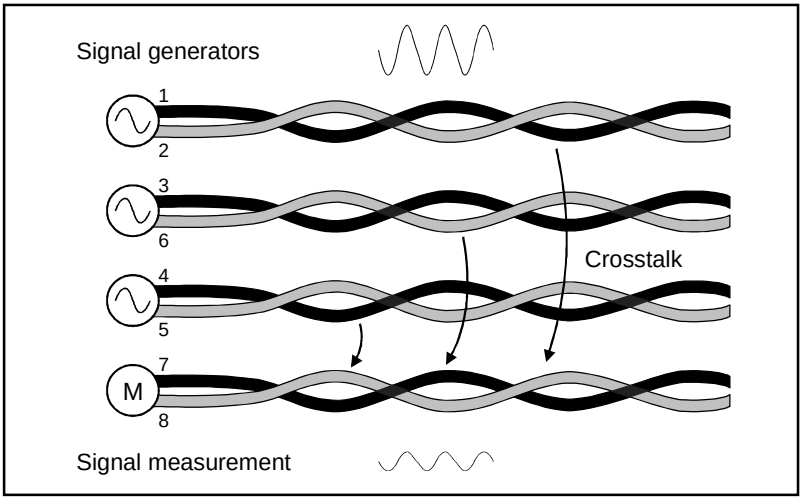


Figure 5-1. Power Sum NEXT Measurement

As shown above, Power Sum NEXT is a sum of the pair-to-pair NEXT and is always greater than any pair-to-pair NEXT.

The Power Sum NEXT test uses the same test limit as pair-to-pair NEXT. Since Power Sum NEXT is always greater than pair-to-pair NEXT, the Power Sum NEXT test holds the cable up to a higher standard.

Emerging high speed Networks (e.g. 622 Mbps ATM, Gigabit Ethernet) are using several pairs for transmitting data. Power Sum NEXT is an important measure of the crosstalk noise coupled from these transmitters to the receive pair.

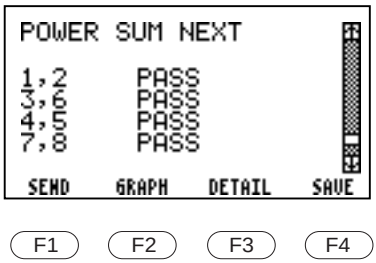
Power Sum NEXT is tested only during an Autotest. It is included in Autotest for the enhanced Category 5 and Class D cable test standards (e.g. Cat5 Plus BasicLnk, ISO Plus Class D).

VIEWING POWER SUM NEXT RESULTS

At the conclusion of Autotest, press VIEW (F3) to view the test results and press the arrow keys to display the Power Sum NEXT results.

The Power Sum NEXT of each pair combination is compared to the selected cable test standard and pass or fail is indicated.

Power Sum NEXT Summary Results

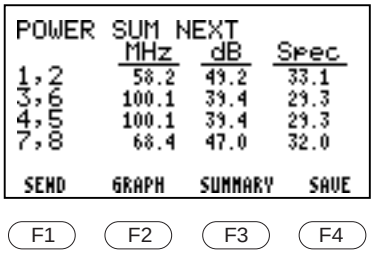


The worst measured crosstalk is shown in the detailed test display. The display indicates the frequency of this measurement, the measured value in decibels (dB) and the test limit.

To View the details of the Power Sum NEXT test:

1. From the Power Sum NEXT summary result screen, press DETAIL (F3).

Detailed Power Sum NEXT Results

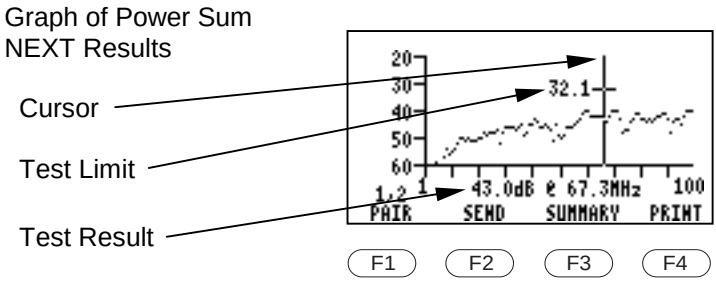


2. On a TwoWay System, press SEND (F1) to send the results to the Remote Unit.
3. Press SUMMARY (F3) or ESC to return to the summary screen.

VIEWING A GRAPH OF POWER SUM NEXT RESULTS

To view a graph of the Power Sum NEXT test results:

1. From the detail or Summary Results screen, press GRAPH (F2).



2. Press PAIR (F1) to display the results for a different wire pair. On a TwoWay System, press SEND (F2) to send the results to the Remote Unit.
3. Press the arrow keys to move the cursor to a new point on the graph. The test result at the selected point is displayed below the graph.
4. Press PRINT (F4) to send a comma-separated variable (CSV) listing of the results to the serial port. This outputs a complete listing of all Power Sum NEXT measurements for all pairs.
5. Press SUMMARY (F3) or ESC to return to the Summary screen.

NOTE

The test result displayed on the graph is the worst value found within 1 MHz frequency increments for Category 5 and ISO Class D testing. All test results are available and can be output from the LANcat.

Cable Grading

Cable Grading refers to the performance grading of cable based on the NEXT performance relative to the test limit. A higher grade cable exceeds the test limit by a greater margin.

Cable grading is only available for Category 5, Category 5 Plus, Class D and Class D Plus Cable Test Standards.

NEXT measurements from 1-100 MHz are compared against seven grades, as shown in Figure 5-2. The LANcat reports the worst grade for each pair.

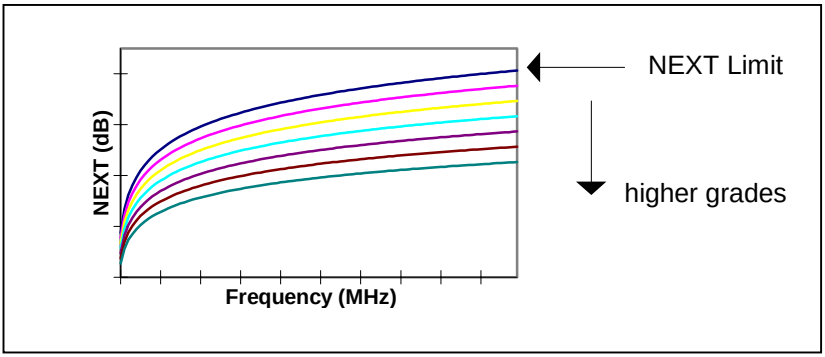


Figure 5-2. Cable Grading

Each cable grade is 3dB wide at 100 MHz. Higher grade cables exceed the applicable test standard (Cat 5 or Class D) by a larger margin. Cables tested with the Cat 5 or Class D Cable Test Standards are graded based on pair-to-pair NEXT performance. Cables tested with the enhanced Cat 5 Plus or Class D Plus Cable Test Standards are graded based on Power Sum NEXT performance.

Cable grading can only be run as part of Autotest and must be enabled. To enable cable grading, you must create a custom Cable Test standard based on a Cat 5, Cat 5 Plus, Class D, or Class D Plus Cable Test Standard - see Appendix A.

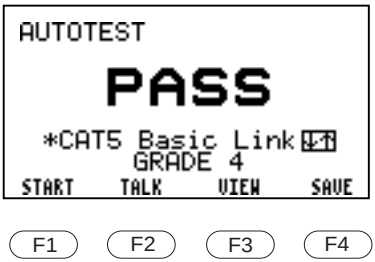
If you want to grade cable based on pair-to-pair NEXT performance, select either a Cat 5 or Class D Cable Test Standard to create the custom Cable Test Standard.

If you want to grade cable based on Power Sum NEXT performance, select either a Cat 5 Plus or Class D Plus Cable Test Standard to create the custom Cable Test Standard.

VIEWING CABLE GRADING RESULTS

The screen below appears at the conclusion of an Autotest. The overall grade of the cable will be displayed below the pass/fail indication (in this case, the cable is a grade 4 cable). The "overall grade" is the worst case grade for all pairs.

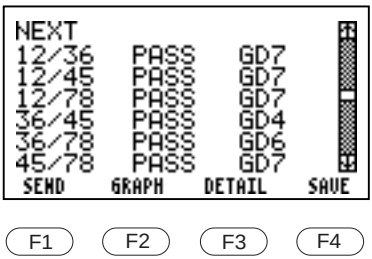
Cable Grading Summary Results



To view the cable grades for individual wire pairs:

1. Press VIEW (F4).
2. Press ↓ arrow key until the NEXT results appear.
   The cable grades for individual wire pairs are displayed.

Detailed Cable Grading Results



If Autotest was run using the enhanced Category 5 Plus or Class D Plus Cable Test Standards, cables are graded based on Power Sum NEXT. To view the cable grades for individual wire pairs, press ↓ key until the Power Sum NEXT test results appear at the conclusion of Autotest.

Length

The Length test measures the cable length and the distance to a cable fault, such as a short, open or impedance change.

The Length test locates significant impedance changes or anomalies in a cable segment that may be caused by cable damage or inadequate connections at patch panels, cross-connect blocks, 8-position modular plug connectors, or wall plates.

Length is one of the tests run during Autotest and Quick Check. This test can also be run individually.

Length performs the following tests:

- **Measures length of each pair**
- **Locates up to two intermediate impedance anomalies**
- **Measures propagation delay of each pair**

NOTE

The accuracy of a Length measurement is very dependent on the proper cable NVP setting. Refer to Chapter 9, Calibration, for the procedure to calibrate cable NVP.

RUNNING LENGTH TEST INDIVIDUALLY

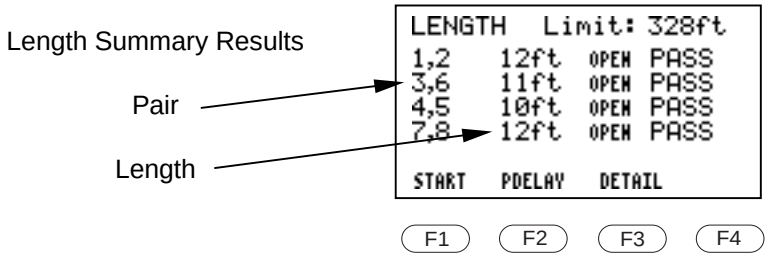
1. Connect one end of the cable under test to the LANcat.
2. Set dial to LENGTH. The test begins scanning immediately.
3. Press the arrow keys to select another cable test standard.

NOTE

For accurate results, do not use the Remote Unit when performing a Length measurement test, except during Autotest or Quick Check.

VIEWING LENGTH RESULTS

At the completion of the Length test, the screen displays the summary results.



1. Press START (F1) to restart the Length test.
2. Press DETAIL (F3) to view more information about the Length test results.
3. Press PDELAY (F2) to view the Propagation Delay for each pair.

NOTES

1. Some variation in the measured length of wire pairs within the same cable is considered normal. This is due to the difference in construction of the individual pairs.

   Length variation from pair to pair will be greater for longer cable lengths.

2. An asterisk (*) next to a PASS result indicates that the measured value is close enough to the standard input that it is within the measurement uncertainty of the LANcat.

3. When measuring spooled and other uninstalled cables, the cable length will probably be greater than the specification test limit. This will cause a FAIL Length test result. In this case, you may ignore the fail message.

4. A cable found to have a “short” will cause length test to FAIL regardless of measured length.

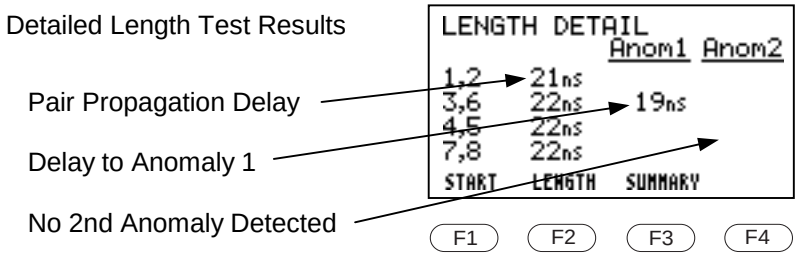
5. OPEN or SHORT usually indicates that a pair ends in an open or a short. However, if the Remote Unit is used, an OPEN result should be displayed for each pair.

6. Propagation Delay is the time in nanoseconds for a pulse to travel the length of a twisted pair.

7. For instruction on changing length units (feet/meters), refer to Chapter 8, Set Up.

To view more information about the Length test results:

1. Press DETAIL (F3).



2. Press SUMMARY (F3) or ESC to return to the Length test summary display.

NOTE

Detected impedance changes greater than the Fault Threshold are displayed as anomalies (Anom1 and Anom2). Fault Threshold is factory pre-set, but can be modified in the SETUP menu. See Chapter 8, Set Up, for Fault Threshold changes.

When the cable length is less than 20 feet, anomalies may not be detected.

Delay/Delay Skew

Delay is a measure of the time electrical signals take to propagate from one end of the cable to the other end.

The difference in propagation delays from one cable pair to another is called Delay Skew.

The Delay test measures and displays the propagation delay of each wire pair. The Delay Skew test measures and displays the difference in propagation delay from each wire pair to the shortest wire pair.

Both Delay and Delay skew are becoming important parameters for emerging high speed LAN standards such as 100BaseT4, 622 Mbps ATM and Gigabit Ethernet.

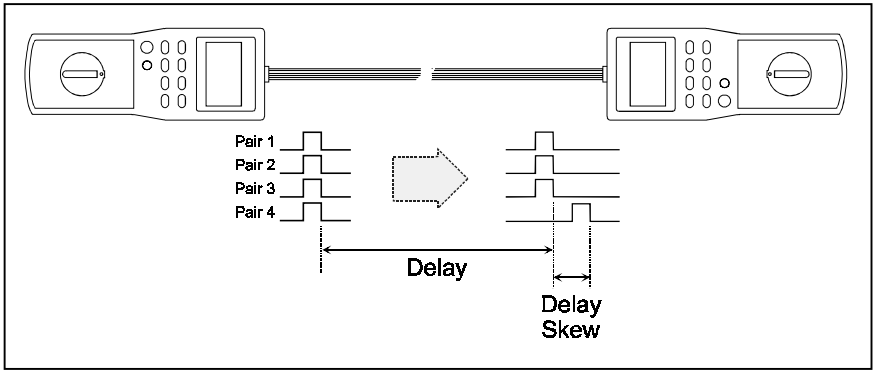


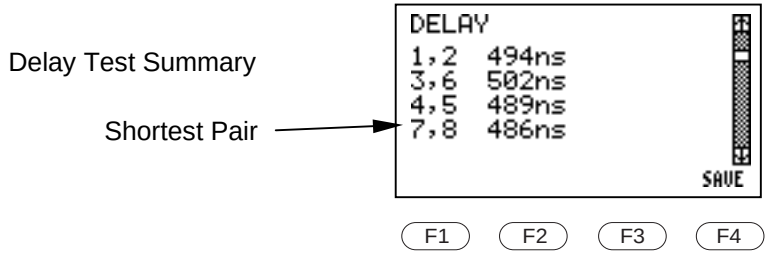
Figure 5-2. Delay/Delay Skew

Delay and Delay Skew are tested only during an Autotest or Quick Check. They are included in Autotest for the enhanced cable standards (e.g. Cat5 Plus BasicLnk). These tests can be added to Autotest or Quick Check for any other cable standard by defining a custom cable standard - see Appendix A.

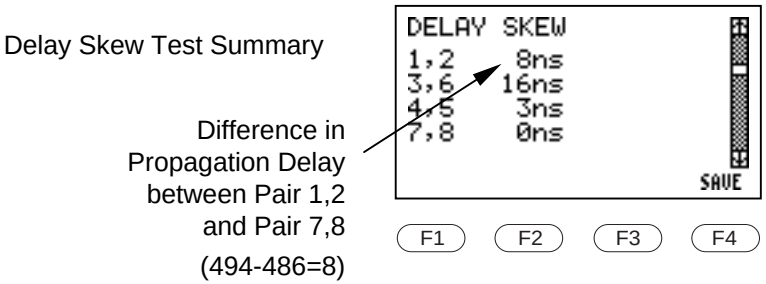
VIEWING DELAY/DELAY SKEW RESULTS

At the conclusion of an Autotest or Quick Check:

1. Press VIEW (F3) to view test results.
2. Press ↓ or ↑ until Delay test summary screen is displayed.



Press ↓ to view Delay Skew test summary. This screen shows the additional delay time for each pair, compared to the shortest pair.



Attenuation

Attenuation measures the reduction in the signal level as it travels over the length of a cable.

Attenuation is measured over a range of frequencies. The amount of attenuation loss is expressed in decibels (dB). A signal is transmitted by the remote unit and received by the main unit (i.e., the signal is OneWay).

Attenuation is one of the tests run during Autotest and Quick Check. It can also be run individually.

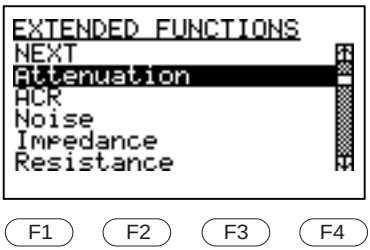
Attenuation detects:

- **One-way attenuation of each cable pair**
- **Poor connections/terminations**
- **Substandard wire**
- **Faulty connectors**

RUNNING ATTENUATION

1. Set the LANcat dial to EXTENDED FUNCTIONS.
2. Press the arrow key to select Attenuation.

Running Attenuation



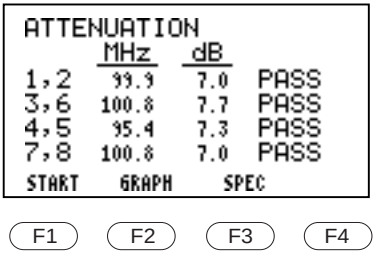
3. Press ENTER. The test begins immediately.
   (Press the arrow keys to select another cable test standard).
4. Press START (F1) to re-run the test.

VIEWING ATTENUATION RESULTS

To view the test standard specification values:

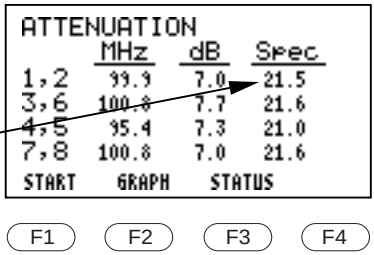
1. Press SPEC (F3).

Attenuation Test Summary



Attenuation Test Summary
(Test Specification Shown)

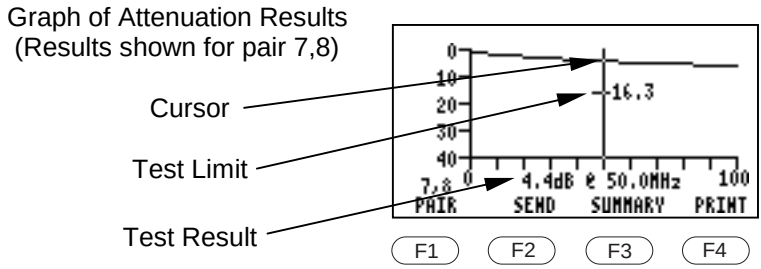
Test Specifications



2. Press START (F1) to re-start the Attenuation test.

VIEWING A GRAPH OF ATTENUATION RESULTS

1. From the test summary screen, press GRAPH (F2) to view the graph of the Attenuation test results.



2. Press PAIR (F1) to display an Attenuation graph for a different pair.
3. Press the arrow keys to move the cursor to another point on the graph.
4. On a TwoWay System, press SEND (F2) to send the results to the Remote Unit.
5. Press PRINT (F4) to send a comma-separated variable (CSV) listing of the results to the serial port. This provides a complete listing of all Attenuation measurements for all pairs.
6. Press SUMMARY (F3) or ESC to return to the summary screen.

Marginal Test Results

A PASS* or FAIL* result indicates that a measured NEXT or attenuation value is close enough to the Test Standard that it is within the measurement uncertainty of the LANcat. As a result, the PASS or FAIL judgment is uncertain, and therefore the LANcat can not determine with confidence that the link conforms to the Test Standard.

The following steps may be taken in order to resolve link tests with marginal measured results:

1. Reduce the measurement uncertainty. If you are currently using a Level I-rated Performance Module (PM), replace it with a Level II-rated PM and retest. If the test result is still marginal, or if you are already using a Level II-rated PM, proceed to the next step.
2. Recheck the link installation, focusing on connection points. Refer to Chapter 7, Testing Twisted Pairs, for suggestions on causes for excessive NEXT and attenuation. Correct installation if possible, and retest.

ACR

Attenuation-to-Crosstalk Ratio (ACR) is the difference between crosstalk and attenuation, measured in dB, at a given frequency. ACR is computed based upon the measured values of attenuation and NEXT.

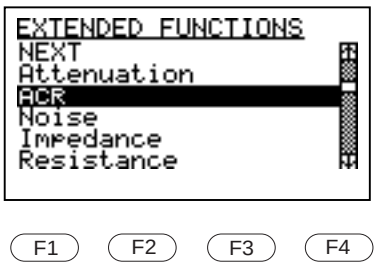
A positive ACR is necessary to assure that a signal at the receiving end of a channel is stronger than the crosstalk interference imposed from adjacent wire pairs. ACR is therefore an indication of the expected reliability of data transmissions.

ACR is automatically computed during Autotest and Quick Check when testing twisted pair cable. It can also be run individually as an Extended Function test.

RUNNING ACR INDIVIDUALLY

1. Set dial to EXTENDED FUNCTIONS.
2. Press the arrow keys to highlight ACR.

Selecting ACR

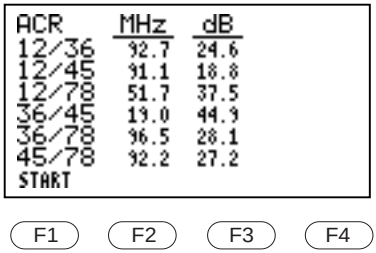


3. Press ENTER. The test begins scanning immediately. (Press the arrow keys to select another cable test standard.)

VIEWING ACR RESULTS

For each pair combination the ACR is displayed along with the frequency. The attenuation value used is from the receive pair (e.g., pair 3,6 of 12/36).

ACR Detail Screen



Press START (F1) to restart the test.

NOTE

Minimum ACR is not presently specified in most link test standards (such as TIA TSB-67) or network standards (such as IEEE 802.3). ISO 11801 requires at least 4 dB of ACR at 100 MHz. Hub manufacturers recommend a minimum of 5 dB for reliable data transmission.

Noise

Impulse Noise is non-repetitive electrical spikes or pulses caused by external electro-magnetic fields.

Impulse noise is one of the primary causes of inconsistent performance on unshielded twisted pair networks.

The Noise test counts noise impulses (spikes) greater in amplitude than a minimum threshold on an idle twisted pair cable segment and provides a report of the results.

Noise results for all selected cable types are compared to the IEEE 802.3 10BASE-T impulse noise specification. The default noise threshold setting is 260 mV. Refer to Chapter 8, Set Up, for information on how to change this value.

Noise reports:

- **Time duration of the test**
- **Average number of impulses in the last second**
- **Peak number of impulses in any one second and the time of occurrence since the start of the test**

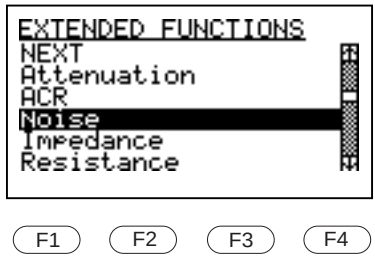
RUNNING NOISE

The Noise test runs continuously until stopped by the user.

1. If testing a twisted pair cable, connect one end of the cable under test to the main unit and the other end to the remote unit. If you are using a TwoWay System, set the Remote Unit's dial to REMOTE.

2. Set the main unit's dial to EXTENDED FUNCTIONS. Scroll through the list of functions until NOISE is highlighted. Press ENTER to select the test. The test begins immediately.
   (Press the arrow keys to change the cable test standard).

Selecting Noise



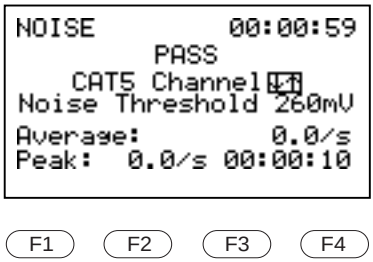
NOTE

The cable should not be connected to an active network during the Noise test because the test will record network traffic as noise impulses.

VIEWING NOISE RESULTS

The display provides a continuously updated, real-time report illustrated by the following figure:

Noise Results



NOTE

When testing a 10BASE-T cable per the IEEE 802.3 specification, the maximum allowable impulse noise rate is 0.2 impulses per second with a 260 mV noise threshold.

Pair Reversal Test

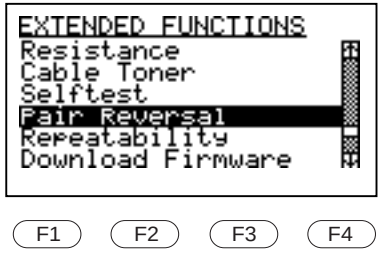
The Pair Reversal Test switches the transmit and receive pairs used for NEXT measurement and verifies that the resulting measurements are essentially unchanged.

The Pair Reversal Test provides a means to verify the NEXT measurement consistency of the LANcat as recommended by the EIA/TIA TSB-67 Link Testing Standard. In the Pair Reversal Test, the NEXT of a link is first measured when transmitting on one pair and receiving on another. Then the test is performed again with the transmit and receive pairs reversed. The results should agree within the magnitude of the LANcat NEXT measurement accuracy specification. The test is performed automatically on all pair combinations.

RUNNING PAIR REVERSAL

1. Connect one end of the cable under test to the LANcat and the other end to the remote unit. If you are using a TwoWay System, set the remote unit's dial to Remote.
2. Set dial to EXTENDED FUNCTIONS.
3. Press the arrow keys to highlight PAIR REVERSAL.

Selecting Pair Reversal



4. Press ENTER. Press ESC to abort the test.
   (Press the arrow keys to select another cable test standard.)

Repeatability Test

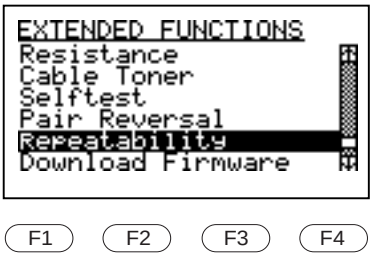
The Repeatability Test confirms that multiple NEXT measurements are essentially the same.

The Repeatability Test provides a means to verify the NEXT measurement consistency of the LANcat as recommended by the EIA/TIA TSB-67 Link Testing Standard. In the Repeatability Test, NEXT tests are performed twice on the same pair combination and the measured results compared. Differences should be less than the magnitude of the LANcat NEXT measurement accuracy specification.

RUNNING REPEATABILITY

1. Connect one end of the cable under test to the LANcat and the other end to the remote unit. If you are using a TwoWay System, set the remote unit's dial to Remote.
2. Set dial to EXTENDED FUNCTIONS.
3. Press the arrow keys to highlight REPEATABILITY.

Selecting Repeatability



4. Press ENTER. Press ESC to abort the test.
   (Press the arrow keys to select another cable test standard.)

Impedance

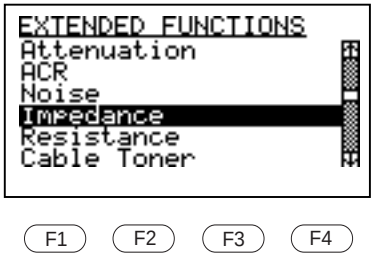
Impedance is a measure of resistance to AC current flow by a cable.

Impedance is an important attribute of a cable. High speed data transmission systems will not perform well unless cabling having the correct impedance is installed. Each cable standard calls for a specific impedance. Use this test to confirm that the cable is of the required type.

RUNNING IMPEDANCE

1. Connect the LANcat to one end of the cable under test.
2. Set the LANcat's dial to EXTENDED FUNCTIONS. Scroll through the list of functions until IMPEDANCE is highlighted .

Selecting Impedance



3. Press ENTER to select the test. The test begins immediately. Press ESC to abort the test. (Press the arrow keys to change the cable test standard).

NOTE

The cable should not be connected to an active network during the Impedance test.

Resistance (LANcat TwoWay only)

The Resistance test measures and displays in ohms the DC resistance of each wire in the cable.

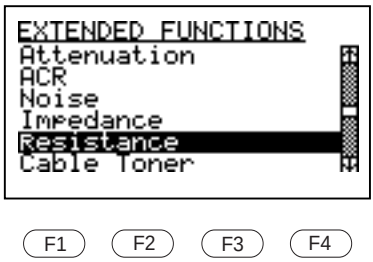
Resistance is a measure of opposition to DC current flow in a cable. DC resistance can be used to identify poor wire connections, which typically have large resistance. Loop Resistance can be derived by adding the resistance for each wire in the pair.

Resistance can be added to the Autotest suite of tests by defining a Custom Cable standard - see Appendix A. Resistance can also be run individually via EXTENDED FUNCTIONS.

RUNNING RESISTANCE

1. Connect the LANcat to one end of the cable under test.
2. Connect the other end of the cable to the Remote Unit.
3. Set the LANcat's dial to EXTENDED FUNCTIONS. Scroll through the list of functions until RESISTANCE is highlighted.

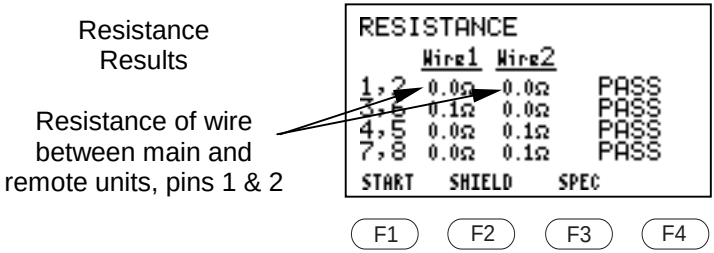
Selecting Resistance



4. Press ENTER to select the test. The test begins immediately. Press ESC to abort the test. (Press the arrow keys to change the cable test standard).

VIEWING RESISTANCE RESULTS

The resistance for each wire in a wire pair is displayed.



1. Press SPEC (F3) to view the test standard specification value
2. Press SHIELD (F2) to view the resistance of the cable shield
3. Press START (F1) to re-start the resistance test.

Cable Toner

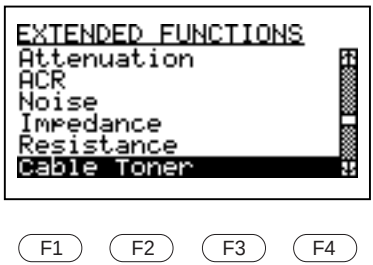
The Cable Toner function injects an audible frequency signal on a cable to enable cable identification by a cable toner probe.

A modulated ~1KHz signal is injected on pin one (1). Any commercially available Toner Probe can be used to identify the corresponding cable end in a remote wiring location.

RUNNING CABLE TONER

1. Connect one end of the cable under test to the LANcat.
2. Set dial to EXTENDED FUNCTIONS.
3. Press the arrow keys to highlight CABLE TONER.

Selecting Cable Toner



4. Press ENTER. Press ESC to abort the test.

NOTE

When the AUTO TONER is ON (see Chapter 8, Setup) the toner function is activated whenever a remote is not attached and the main unit is set to Quick Check or Autotest. When a remote is attached, the toner is turned OFF automatically and the test proceeds. This makes it easy to identify which cable is ready to be tested next.

6. PRINTING, UPLOADING AND VIEWING TEST RESULTS

The Print function allows you to send test results to a serial printer, upload the test results to a PC or view stored test reports before printing or uploading.

The Print function allows you to:

- **Print some or all of the saved reports**
- **Print the last Traffic Report**
- **Delete saved reports**
- **View saved reports**

Connecting To a PC or Printer

OVERVIEW

Connect the single, 9-pin connector end of the PC Interface Cable to the SERIAL PORT on the LANcat. Connect the other end (dual connector, use either 9 or 25 pin connector) to a printer or PC.

NOTE

Make sure you do not leave the unit connected to the PC while making measurements. Doing so may cause a Wiremap Fail error to occur.

ADAPTER/CONNECTOR INFORMATION

The PC Interface Cable supplied with the LANcat may not be the correct connector to properly connect to all serial printers. Use only straight through adapters to connect the PC Interface Cable to a printer.

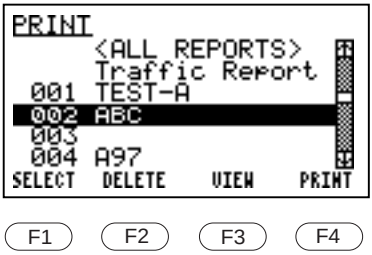
Connectors with different pin assignments than those mentioned above may affect output operation (see Appendix C, Specifications for the Serial Port pin assignments).

Printing/Uploading Test Results

PRINTING/UPLOADING A SINGLE TEST REPORT

1. Set dial to PRINT to display the Print menu.

Print Menu
(Test 002 Selected)

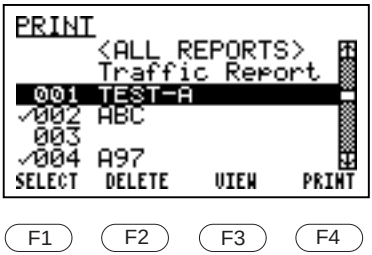


2. Press the arrow keys to highlight the test report you wish to print or upload.
3. Press PRINT (F4) or ENTER.
4. Follow the procedure in “Changing Serial Port Settings” in this chapter.

PRINTING/UPLOADING MULTIPLE REPORTS

1. Set dial to PRINT to display the Print menu.
2. Press the arrow keys to highlight a test report you wish to print or upload.
3. Press SELECT (F1) to place a check mark next to the report number.

Print Menu
(Tests ABC & A97 selected)



4. Repeat steps 2 and 3 above to select all reports to be printed/uploaded.
5. Press PRINT (F4) or ENTER.
6. Follow the procedure in “Changing Serial Port Settings” in this chapter.

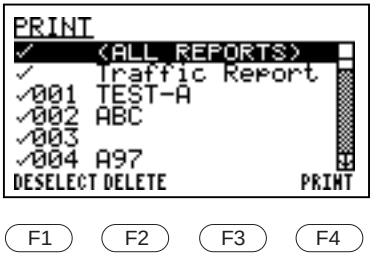
NOTE

Reports can also be de-selected by highlighting a selected report and pressing DESELECT (F1).

PRINTING/UPLOADING ALL REPORTS

1. Set dial to PRINT to display the Print menu.
2. With <ALL REPORTS> highlighted, press SELECT (F1) or ENTER.
3. Press PRINT (F4) or ENTER.

Print Menu
(All Tests Selected)



3. Follow the procedure in “Changing Serial Port Settings” in this chapter.

NOTE

Any selected test reports can be deselected by highlighting report number and pressing DESELECT (F1), prior to PRINT.

UPLOADING DETAILED NEXT/ATTENUATION RESULTS

Detailed NEXT or Attenuation test results can only be output to a PC immediately following completion of the test.

To upload detailed NEXT or Attenuation test results:

1. Complete the Autotest, individual NEXT or individual Attenuation test.
2. Select GRAPH (F2) screen from the summary screen.
3. Press PRINT (F4).

NOTE

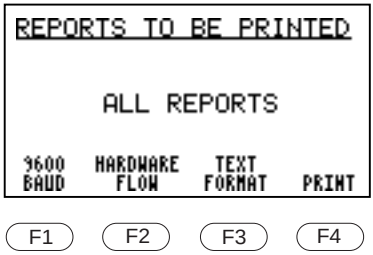
Detailed NEXT and Attenuation test results can only be uploaded to a PC in Comma Separated Variable (CSV) format. Serial Port settings (baud rate and flow control) are determined by SETUP parameters, See Chapter 8, Set Up.

CHANGING SERIAL PORT SETTINGS

You can change the serial port settings for these selections:

- **BAUD rate**
- **Flow control**
- **Output report format**

Print Screen



The serial data format is fixed at 8-bit, no parity, 1 stop bit (8N1).

1. Press BAUD (F1) to increment from 1200 to 38400 baud.
2. Press FLOW (F2) to select flow control
   a. XON/XOFF (software)
   b. HARDWARE (CTS/DTR)
   c. NONE (for no flow control).
3. Press FORMAT (F3) to select the output format and choose from the following:
   a. TEXT (F3) for a pre-formatted report ready for printing.
   b. COMMA (F3) for comma separated variables (CSV) suitable for uploading to a computer and importing to a database or spreadsheet.
4. Press PRINT (F4) to begin print/upload.
5. To abort a report print out, press ESC.

NOTE

Serial port setting changes are automatically stored in non-volatile memory.

Deleting Test Reports

Reports may be deleted from memory by performing the following steps:

1. Set dial to PRINT to display the Print menu screen.
2. Press the arrow keys to highlight the test report you wish to delete.
3. Press SELECT (F1) to select specific reports to be deleted. A check mark appears next to the report number.

NOTE

To select all reports for deletion, press SELECT (F1) when <ALL REPORTS> is highlighted. This selects all of the report numbers.

4. Press DELETE (F2). A screen displays the selected report numbers and asks you to confirm that you wish to delete the tests. (If no reports were selected, the highlighted report is selected for deletion).
5. Press OK (F4) or ENTER to delete the report. After the report is deleted, the unit returns to the Print screen.

   or

   To cancel the DELETE, press CANCEL (F1) or ESC and return to the Print screen.

Viewing Saved Test Reports

To review a saved report:

1. Set dial to PRINT to display the Print menu screen.
2. Press the arrow keys to highlight the number of the test report you wish to view.
3. Press VIEW (F3) to view the report.
4. Press the arrow keys to view different test results.
5. Press ESC to return to the Print menu screen.

NOTE

Refer to Chapter 5, Cable Test Descriptions for further information on interpreting test result screens.

```
                    LANcat  CABLE CERTIFICATION REPORT #3

                                Company Name Here

Circuit ID: H7/B6-61                          Date Tested: 06/24/1996
Cable Test Standard: CAT5 Basic Link          Module Type: Modular Plug
Location: _____________________________       Remote Module Type: TwoWay Remote
                                              Serial Number: 9510704  V2.41D1
                                              Cable NVP:  72.0%
TEST SUMMARY: PASS
-------------------------------------------------------------------------------
Wire Map: PASS  Near End   1    2    3    6    4    5    7    8   Shield
                           |    |    |    |    |    |    |    |   open
                Remote End 1    2    3    6    4    5    7    8

-------------------------------------------------------------------------------
Length: PASS    Limit: 308ft
                Pair  Length  Comment
                1,2   3ft     OPEN
                3,6   3ft     OPEN
                4,5   3ft     OPEN
                7,8   3ft     OPEN
-------------------------------------------------------------------------------
Attenuation:   PASS        1,2      3,6      4,5      7,8
                         PASS     PASS     PASS     PASS
  Attenuation   dB          1.9      1.8      2.0      2.3
  Limit         dB         19.8     20.0     21.6     20.1
  Margin        dB        +17.9    +18.2    +19.6    +17.8
  Frequency     MHz        86.4     87.3    100.8     88.2
-------------------------------------------------------------------------------
Local NEXT:  PASS     12/36     12/45     12/78     36/45     36/78     45/78
                       PASS      PASS      PASS      PASS      PASS      PASS
    NEXT       dB      43.7      44.5      76.5      36.4      45.5      43.2
    Limit      dB      31.0      29.3      60.0      29.4      32.2      29.3
    Margin     dB     +12.7     +15.2     +16.5      +7.0     +13.3     +13.9
    ACR        dB      41.9      42.5      76.5      34.4      43.8      41.9
  Frequency    MHz     79.2     100.1       1.1      99.0      66.8     100.1

Remote NEXT: PASS     12/36     12/45     12/78     36/45     36/78     45/78
                       PASS      PASS      PASS      PASS      PASS      PASS
    NEXT       dB      42.6      41.5      83.5      34.9      45.4      43.8
    Limit      dB      29.5      30.9      60.0      29.3      32.9      29.3
    Margin     dB     +13.1     +10.6     +23.5      +5.6     +12.5     +14.5
    ACR        dB      41.5      39.9      83.5      32.9      43.9      42.5
  Frequency    MHz     97.6      80.3       1.1     100.1      60.5     100.1
Operator: _____________________       Date: _____________________

Comments:
```

Remote: TwoWay Only

Figure 6-1. Sample Autotest Text Report

```
                        LANcat  NETWORK TRAFFIC REPORT

Start Time: 15:29:14      Date: 08/08/1995      Operator:
Cable Test Standard: 10Base-T                   Module Type: Modular Plug
Location: _____________________                 Serial Number: 0000000
Notes:



*** Average Utilization    --- Peak Utilization     C = % Collisions

                        Percent Network Utilization
Time     0    5    10   15   20   25   30   35   40   45   50   75  100  Packet
HH:MM:SS +----+----+----+----+----+----+----+----+----+----+----+----+    Rate
00:00:10 ***-------                                                        336
00:00:11 ***                                                               345
00:00:12 **                                                     NO LINK    153
00:00:13                                                        NO LINK      0
00:00:14                                                        NO LINK      0
00:00:15                                                        NO LINK      0
00:00:16                                                        NO LINK      0
00:00:17                                                        NO LINK      0
00:00:18                                                        NO LINK      0
00:00:19 *                                                      NO LINK     66
00:00:20 ***                                                               260
00:00:21 ***                                                               225
00:00:22 ***                                                               321
00:00:23 ***                                                               299
00:00:24 ***                                                               270
00:00:25 ***                                                               325
00:00:26 ***                                                               272
00:00:27 ***                                                               285
00:00:28 ***                                                               299
00:00:29 ***                                                               310
00:00:30 ***                                                               297
00:00:31 ***                                                               273
00:00:32 ***                                                               341
00:00:33 ****                                                              400
00:00:34 *C**                                                              372
00:00:35 ****                                                              472
00:00:36 ********                                                         1070
00:00:37 *C******                                                         1192
00:00:38 *******                                                          1027
00:00:39 ******                                                            924
00:00:40 ******                                                            963
00:00:41 ******                                                            897
00:00:42 ******                                                            924
00:00:43 ******                                                            980
00:00:44 ******                                                            962
00:00:45 ******                                                            984
00:00:46 ******                                                            961
00:00:47 *****                                                             664
```

Figure 6-2. Sample Traffic Text Report

7. TESTING TWISTED PAIR CABLE

This chapter contains information about the fundamentals of testing twisted pair cables. This chapter also discusses common wiring problems and reasons that cables fail. Tables of troubleshooting tips are provided throughout the chapter. The tables can be used as a quick reference when troubleshooting a cable segment.

Types of Twisted Pair Cable

Twisted pair cable is so called because of the physical make up of the cable. Two wires are physically twisted together along the length of the cable to form a pair.

There are three basic kinds of twisted pair cable: Unshielded Twisted Pair (UTP), Shielded Twisted Pair (STP), and Screened Twisted Pair (ScTP). Figure 7-1 illustrates the differences in the construction of twisted pair cables.

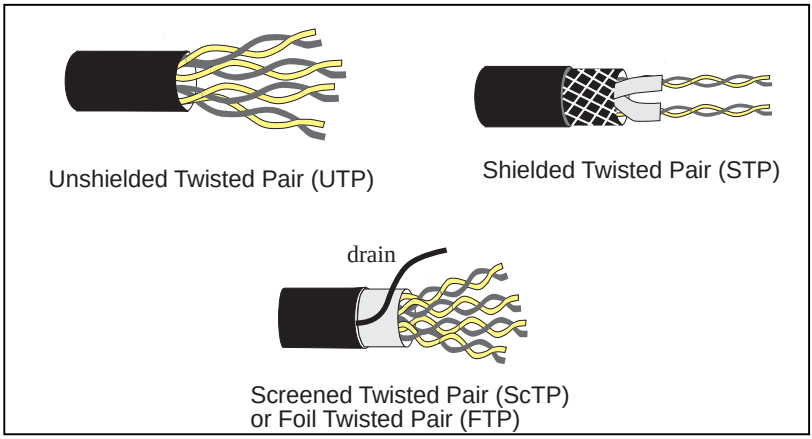


Figure 7-1. Twisted Pair Cable Construction

Although UTP is one of the most popular cable test standards to install, it is also highly susceptible to a variety of failures if the cable is not properly installed. The LANcat checks for these possible failures. The test or tests you choose to run depend on whether you are performing a complete check of cable characteristics compared to a standard (cable certification) or troubleshooting a specific cable problem. See Appendix A, Cable Test Standards, for an explanation of various test standards.

The TSB 67 UTP Link Performance specification is becoming the benchmark for installed UTP links and is the specification that the LANcat design is primarily based on.

Twisted Pair Test Descriptions

The following test descriptions apply to testing four pair Unshielded Twisted Pair (UTP). However, the fundamental concepts can be applied to testing Shielded Twisted Pair (STP) and Screened Twisted Pair (ScTP) cable.

WIRE MAP

Wire map is used to test the continuity of a cable and also to check for split pairs. Continuity is the electrical connection of a wire from one end of the cable to the other.

Typically when testing twisted pair cable, it is desired to have all wires connected straight-through. Straight-through means that pin 1 of the connector on one end is connected to pin 1 of the connector on the other end, pin 2 is connected to pin 2, 3 to 3 and so on.

Figure 7-2 illustrates correct connectivity and pairing per the TIA 568 specification.

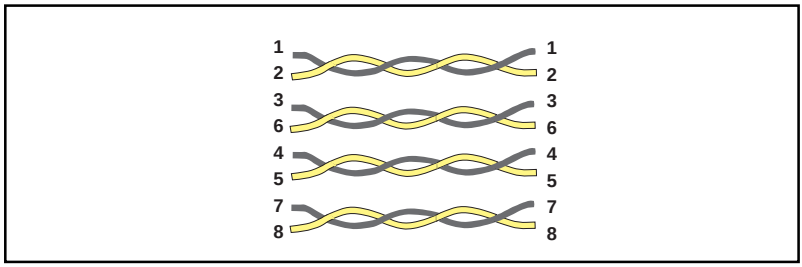


Figure 7-2. TIA-568 Connectivity Requirements

Wire Map checks for shorts, opens, crossed pairs, reversed pairs and other wiring errors. Wire Map also checks the continuity of a shield if one exists.

When installing a new link or modifying an old link, it is very common to accidentally create wiring errors. Figure 7-3 illustrates common continuity wiring errors.

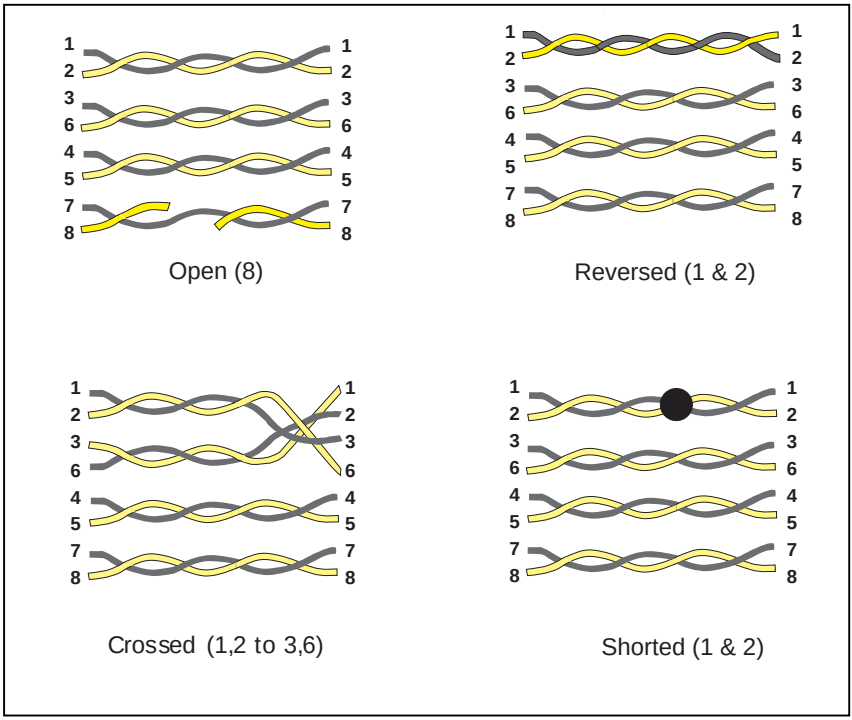


Figure 7-3. Continuity Wiring Errors

In addition to continuity, the TIA-568 also specifies which pins are associated with specific wire pairs in the cable. When pin-to-pin continuity is maintained, but the proper pairs are not, the wiring error is called a Split Pair. A Split Pair causes severe Near-End Crosstalk (NEXT).

Figure 7-4 illustrates an example of a split pair where pins 1 and 2 are split with 3 and 6.

Refer to the following section for an explanation of NEXT.

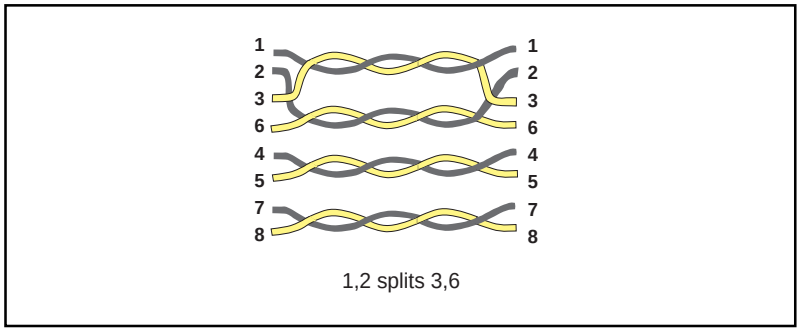


Figure 7-4. Split Pair

NOTE

A split pair cannot be detected with a simple DC continuity check.

The majority of all wiring problems can be found at the termination points. A chart of common wire map problems and suggested solutions is shown below.

Test Results	Possible Solutions
Crossed pair	Depending on what the cable is being used for, this may be okay. A crossed-pair cable is common for a 10BASE-T application when connecting two HUBs. Double check the desired specifications for that segment and re-terminate the segment to correct the wiring if necessary. If problem continues, follow the possible solutions for "*OPEN on one or more of the pairs*" below.
OPEN on one or more of the pairs	Perform a length test to locate fault. Go to the fault and correct wiring error. If you cannot locate the fault by the length test, check all terminations at punch down blocks, patch panels and wall plates. If no miswires are found, back up to the next closest telecommunication outlet, or transition point and test from there. Continue to the next outlet or transition point until fault is isolated. Then, re-terminate segment. If problem continues, it could be a damaged cable.

Test Results	Possible Solutions
SHORT on one or more of the pairs	Follow same procedure as for "*OPEN on one or more of the pairs*."
Remote Unit not connected	Be sure that the main and remote units are connected to the same cable. If correct, follow same procedure as searching for "*OPEN on one or more of the pairs*.."
Reversed pair	Depending on the application, this may be okay. Double check the specification you are testing to and re-terminate the segment if necessary to correct the problem. If problem continues, follow the procedure for "*OPEN on one or more of the pairs*" to locate fault.
Split pair	Make note of which pairs are split. Double check the requirements (which conductors should be paired) for the segment under test. The LANcat is designed to test for EIA/TIA 568 pairing (12,36,45,78). USOC pairing is 18, 27, 36 and 45. If testing a USOC cable, you will get a split pair between pins 1,2 and 7,8.

Test Results	Possible Solutions
	Another common pairing is 12, 34, 56, 78. If testing this type, you will get a split pair message between 3,6 and 4,5. If a split pair is not expected, make sure the cable is twisted pair. Using silver satin untwisted cable will also result in split pairs. Check the coloring of the wiring at all termination points for proper pairing. Correct the wiring as necessary.

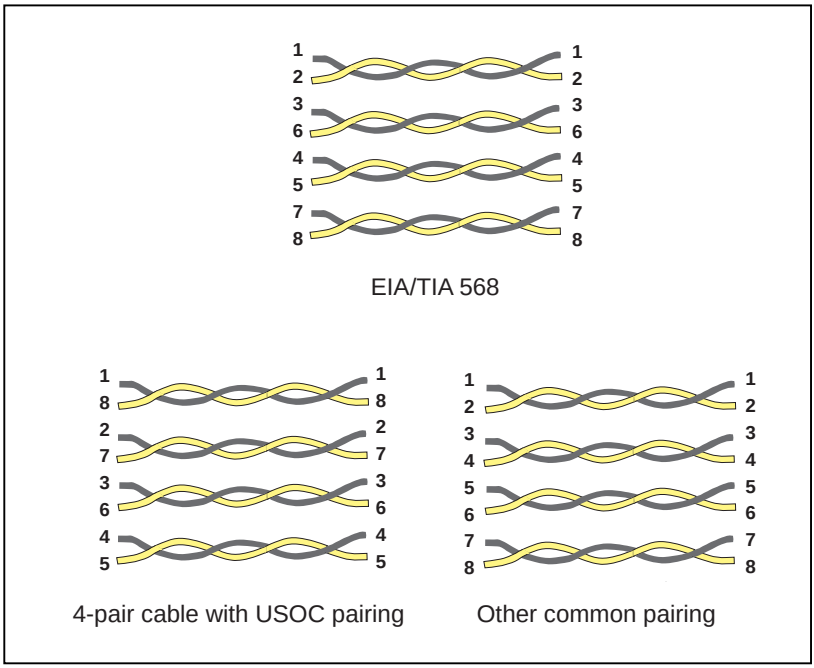


Figure 7-5. Common Wiring Configurations

NEAR-END CROSSTALK (NEXT)

When a signal is transmitted onto one of the pairs, an electromagnetic field is created around the wires that couples the transmitted signal into adjacent pairs. This coupled signal is referred to as Crosstalk. Crosstalk is similar to the problem that occurs in a telephone when you hear another conversation on your line.

If crosstalk is severe enough, the transmitted signal can interfere with the received signal on another wire pair (see Figure 7-6).

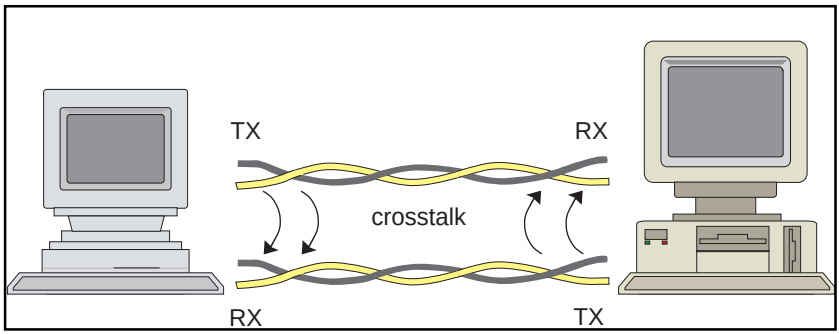


Figure 7-6. Crosstalk Between Stations

Because crosstalk is measured at the same end of the cable as the signal source, the term Near-End Crosstalk (NEXT) is used to describe this measurement (refer to Figure 7-7).

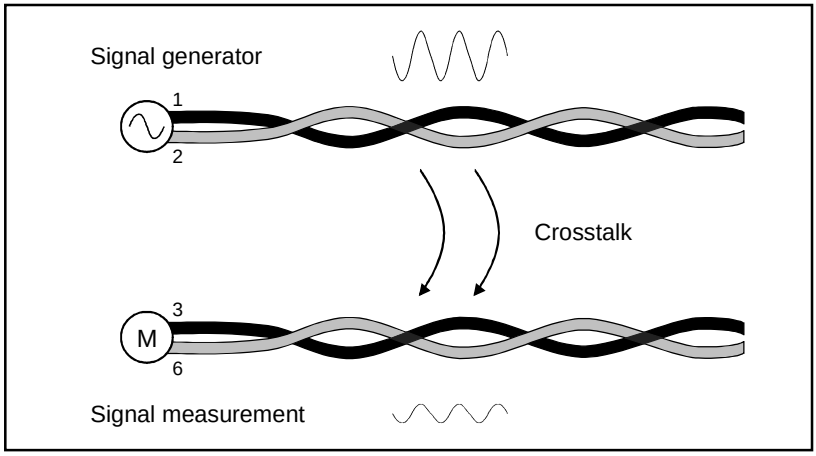


Figure 7-7. NEXT Measurement

The twisting of pairs of wires is essential to minimizing crosstalk effects from pair to pair. The amount of twisting is a key difference between high-performance Category 5 cable and lessor rated cable, such as Category 3.

A common problem with installing Category 5 cable is maintaining the wire twist when terminating the cable. The EIA/TIA 568-A specification states the twists must be maintained to within 0.5 inch (13 mm) of the termination for Category 5 and within 1.0 inch (25 mm) for Category 4. If the twists are not maintained, NEXT will increase.

NEXT also varies with the frequency of the signal, but the relationship is not linear. Therefore, because the NEXT of a cable is within a certain specification at lower frequencies does not guarantee the NEXT will be within the same specifications at a higher frequency. Figure 7-8 illustrates an example of how NEXT varies with signal Frequency.

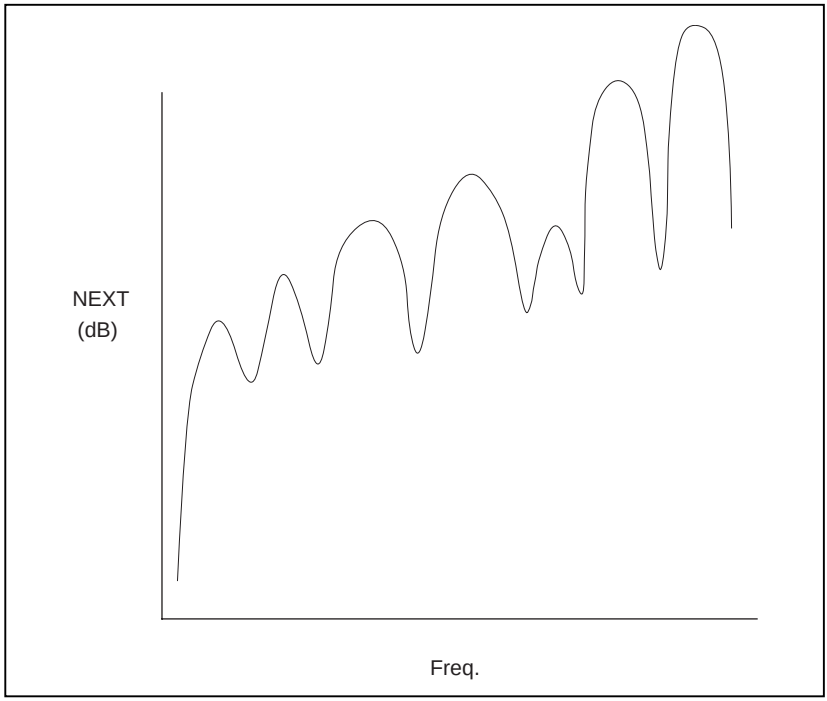


Figure 7-8. Typical Relationship of NEXT and Frequency

NEXT is measured in decibels (dB). A high dB value, which is typically referred to as low NEXT, is good (for example, 48 dB). This means there is a large difference between the transmitted signal and the resulting NEXT. A low dB value, which is typically referred to as high NEXT, is bad (for example, 20 dB). This means NEXT is significant in relation to the transmitted signal.

The following table describes some common causes of NEXT and their solutions.

Common Causes of Excessive NEXT	**Solution**
Bad or low-grade patch cables	Patch cables may not be twisted pair. A common mistake is to use silver satin untwisted cable for data applications. Patch cable could be wired incorrectly. Check twisted pairs per the EIA/TIA 568 pairing. Check patch cable and rewire or replace as necessary.
Terminating points	The most common point for NEXT problems are at the termination points. Untwisting of the wires too far from the termination is very common. Follow procedure for "*NEXT test fails one or more pairs*" to troubleshoot.

Common Causes of Excessive NEXT	Solution
Split pairs	Because of different standards, there are different pair combinations (for example, USOC, EIA/TIA, etc.). Double check requirements and rewire if necessary. For troubleshooting, follow procedure for "*Split Pair*" in Wire Map section.
Use of substandard components (termination components, cable, etc.)	It is common to make the mistake of using couplers or lower grade hardware and/or cable than the minimum expected. The highest category your installation will comply to is that of the lowest category component you have in your segment.

The following troubleshooting table describes some common NEXT problems and some solutions.

Test Results	Possible Solutions
NEXT test fails for one or more pairs	Compare test results to actual expected values to confirm misconformance. Start at tester end and check that all cable is minimum required grade. Check termination hardware to make sure all hardware is at least the minimum grade expected. For example, if testing for Category 3, you could use Category 3, 4 or 5 components. If testing to Category 5, you can only use Category 5 components. Check that termination points meet installation standards. Reference the specification you are using. Re-terminate all connections as necessary. Run Wire Map to check for split pairs. Follow procedure for "*Split Pair*" in Wire Map section.
NEXT test fails in one direction but not in the other	Check the terminations closest to where the faulty readings were detected. Follow procedure for "*NEXT test fails for one or more pairs*" to locate fault.
NEXT test indicates a split pair	Follow procedure for "Split pair" in WIRE MAP section.

Test Results	Possible Solutions
NEXT test fails intermittently	Check actual results to expected results. Values may be borderline. Simply re-terminating a connection could correct problem. Follow procedure for "*NEXT test fails for one or more pairs*" to locate fault.
NEXT passes on segment from hub to work area wall plate, but the workstation has problems when connected with its patch cord	Patch cable may not be a twisted pair cable. A common mistake is to use untwisted telephone wire for data applications. Patch cable could be wired incorrectly. Check twisted pairs per the EIA/TIA pairing. Check patch cable and rewire or replace as necessary. Two pairs of the cable may be in use for data and the other two pairs may be in use for voice.

POWER SUM NEXT

Power Sum NEXT is a critical test for certifying the performance of installed twisted pair links. It is the sum of the pair-to-pair NEXT coupled from all adjacent pairs in a cable.

Power Sum NEXT is an important measurement for emerging high speed local area networks such as 622 Mbps ATM and Gigabit Ethernet. These networks transmit over multiple pairs at once to achieve their high data rates. Because they transmit over several pairs simultaneously, the normal pair-to-pair NEXT is not indicative of the coupled noise signal into the receive pair. Rather, the coupled signal is larger due to the multiple transmitters.

Crosstalk from multiple pairs is illustrated below in Figure 7-9.

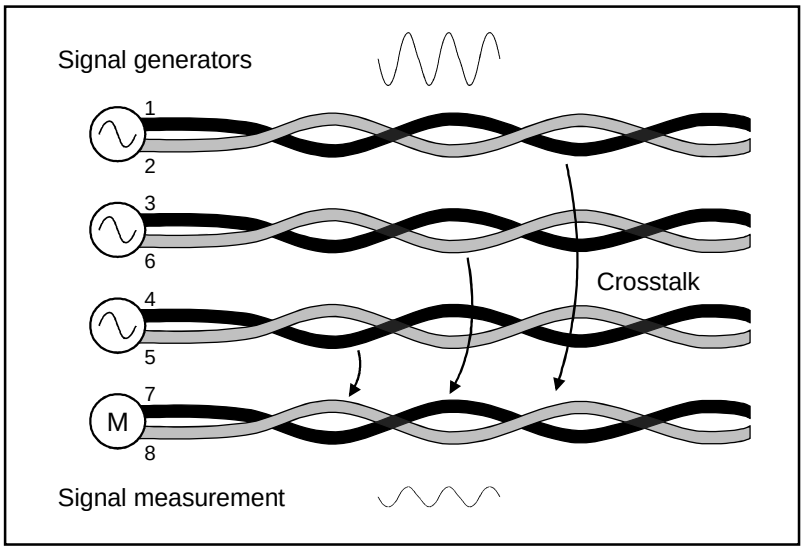


Figure 7-9. Power Sum NEXT Measurement

Calculated Power Sum NEXT compared to pair-to-pair NEXT for a typical link is shown in Figure 7-10. Power Sum NEXT can be nearly 5 dB worse than the pair-to-pair NEXT. Consequently, the Power Sum NEXT test holds the cable up to a higher standard, providing additional assurance that the link will support future high speed networks.

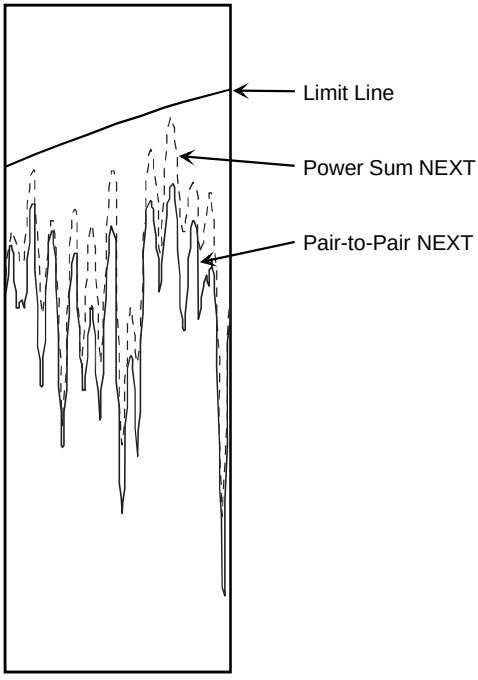


Figure 7-10. Power Sum NEXT Measurement

The characteristics of Power Sum NEXT are very similar to those of NEXT. They both vary with frequency, are measured in decibels (a larger value is better), and are highly dependent on maintaining the wire twist up to the connector when terminating the cable.

To minimize Power Sum NEXT, you must minimize the NEXT of all pairs. Refer to the NEXT table in this chapter for some common causes of excessive NEXT and their solutions.

ATTENUATION

The Attenuation test measures the reduction in the strength or amplitude of a signal as it travels over the length of a twisted pair cable. The amount of this loss is expressed in decibels (dB) (refer to Figure 7-11).

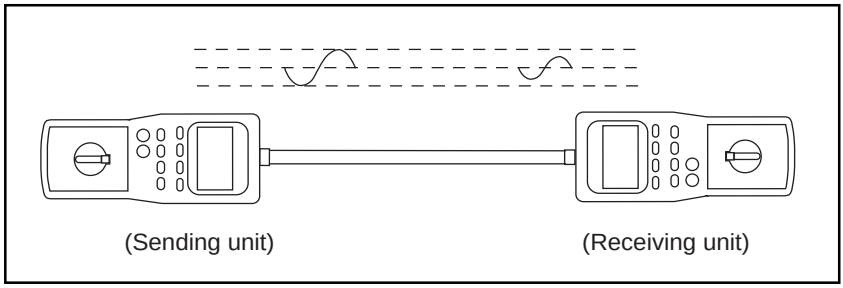


Figure 7-11. Attenuation

Attenuation varies with frequency and length. Typically, attenuation increases with higher frequencies and longer cables.

The following table lists some common causes of Attenuation and possible solutions.

Common Causes of Attenuation	**Solutions**
Incorrect grade cable for application	Be sure to use the correct grade cable for the specification being tested. Lower grade cable can cause greater attenuation.
Patch cables	Patch cables may not be twisted pair. A common mistake is to use untwisted telephone wire for data applications. Make sure patch cable is data grade.
Excessive Length	If specification is based on a maximum length, check length and correct if necessary.
Poor termination	Check all terminations for proper connections. Follow troubleshooting tips mentioned in "*Common Problems for Attenuation*."
Impedance Anomalies	A splice in the segment or damage to a segment can cause excess attenuation. Perform a length test to check for anomalies in segment. If anomaly is detected, go to that point and examine the cable and connections for kinks, cuts, splices, incorrect cable, sharp bends or other. Repair as necessary.

Common Causes of Attenuation	Solutions
Sub-standard components	It is common to make the mistake of using couplers or lower grade hardware and/or cable than the minimum expected. The highest category your installation will comply to is that of the lowest category component you have in your segment.

The chart below describes some attenuation problems and their possible solutions.

Test Results	Possible Solutions
Attenuation test fails for one or more pairs	Compare actual to expected values to confirm misconformance. Check that the length is within specification in applications where attenuation is a maximum limit only. If cable is too long, correct as necessary. Follow procedure for "*NEXT test fails for one or more pairs*" to locate fault.
Attenuation test fails intermittently	Compare actual results to expected results. Values may be borderline. Re-terminating a connection could correct problem. Follow procedure for "*NEXT test fails for one or more pairs*" to locate fault.

LENGTH

The LANcat uses a method called Time Domain Reflectometry (TDR) to measure cable length. With TDR, a signal is transmitted at one end of a cable and, at the same time, a timer is started. The electrical signal travels down the cable until it reaches a change in impedance (for example, an open, a short, a fault in the cable or a cable mismatch) and part or all of the signal is reflected back. If the cable is properly terminated (that is, the terminator is equal to the impedance of the cable), there will be no reflection of the signal and you will not be able to determine the length. Figure 7-12 illustrates the behavior of the electrical signal when it reaches the end of the cable.

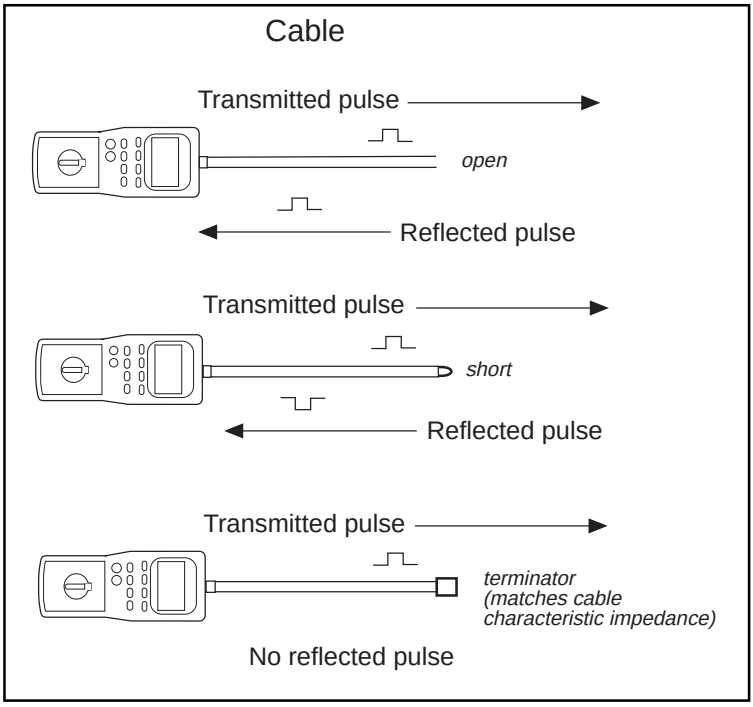


Figure 7-12. Using TDR To Locate Cable Faults

When the reflected signal reaches the tester where the signal was generated, the timer stops. By knowing the speed of the signal traveling down the cable, you can determine the length of the cable.

How do you know how fast the signal travels down the cable? All cables have an inherent characteristic called Nominal Velocity of Propagation (NVP). This value can be determined by contacting the cable manufacturer. NVP is the speed of signal propagation through a cable, expressed as a percentage of the speed of light in a vacuum (refer to Figure 7-13). Using the NVP value and the time to receive the returned TDR pulse, the LANcat calculates the cable length.

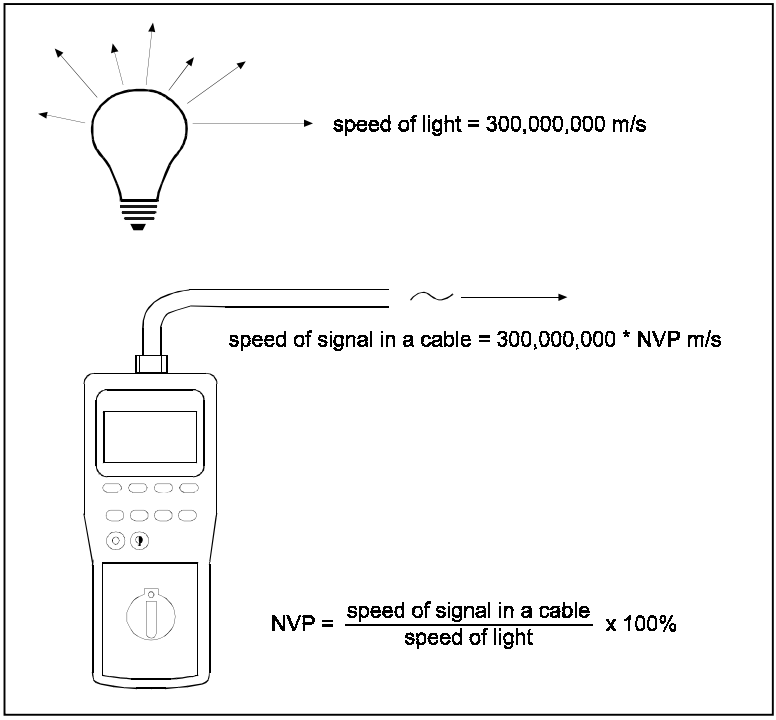


Figure 7-13. Cable Nominal Velocity of Propagation

To obtain the most accurate Length measurement possible, you must calibrate your test equipment to the cable you are testing. Follow the procedure described in Chapter 9, Calibration.

NOTE

It is normal for some variation in the measured length of wire pairs within the same cable. This is due to the difference in construction of the individual pairs. Length variation from pair to pair will be greater for longer cable lengths. Significant differences (more than a few percent) may indicate a fault in a pair.

The actual length of a pair is longer than the length of the cable but the NVP is calibrated to give the length of the cable.

A default threshold value of 7% was chosen for the LANcat. This value corresponds to the worst case allowable impedance discontinuity specified in IEEE 802.3 for coaxial cable. See Chapter 8, Set Up, for information on how to change the default threshold value. If you do not want to see anomalies in your test results, increase the fault threshold value.

The LANcat also detects impedance anomalies as part of the Length test. An anomaly is an impedance mismatch along the cable, but an open or a short is considered the end of the cable, not an anomaly.

An anomaly can be caused by a number of conditions, including a cable mismatch, a cut in the cable, a defect in the cable, a kink in the cable or a poor connection. When the LANcat sends out a TDR pulse, the severity of the change of impedance determines how much of the signal is reflected back. The Fault Threshold setting in the LANcat determines the minimum reflected signal that will be detected as an anomaly.

Typically, twisted-pair specifications do not address impedance anomalies. This is primarily because when an application uses twisted pair, there is a separate transmit pair and receive pair.

Anomalies are more important to consider when the same wire is used for both transmit and receive (for example, coax cable).

The following table describes some common Length problems and solutions.

Test Results	Possible Solutions
Anomaly	Check distance to anomaly. Go to distance indicated and check for obvious problem (for example, splice in cable, couplers, kink or bend in cable, bad connection). Re-terminate the segment to eliminate the problem. If the problem continues, make sure other parameters, such as attenuation, are within limits. If they are, check the specification you are testing to. If nothing is mentioned in specification regarding anomalies and all other parameters are within specification, the segment should be fine. The anomaly threshold was chosen by Datacom Textron to aid you in cable troubleshooting. If you do not desire to view the anomalies, increase the threshold settings (refer to Chapter 8, Set Up).
The length measurement is not accurate	Check that the NVP is correct. If requiring the best accuracy, you must calibrate the unit with a sample of the cable.

Test Results	Possible Solutions
LANcat will not display a length measurement	Make sure cable is connected to LANcat. Disconnect the Remote Unit or any other equipment from the far end of the cable. If cable is less than five feet, the LANcat displays “Cable < 5 feet.” If the cable is longer than 2,000 feet, the LANcat indicates the cable is too long to measure.
The length test reveals OPEN	If the Remote unit is connected during the length test, the Remote creates an OPEN in order to measure the length. If you are concerned about continuity, perform a Wire Map test.
Length exceeds the specification	Compare measured values with expected values. Ensure the NVP is correct by calibrating the unit to the cable. Adjust the length of the cable as necessary.

Test Results	Possible Solutions
Length is double what it should be	Check the termination of the cable. If cable is not connected to the Remote Unit, the termination hardware may automatically loopback pins (for example, IBM Type A connectors). Thus, the length is twice the distance of the cable.
Length says < 5 feet when the cable is longer	Perform a Wire Map test on the segment. If Wire Map shows all pairs are OPEN or SHORT, the LANcat can not detect the Remote Unit. Thus, all pairs are OPEN or SHORT within 5 feet of the LANcat. If Wire Map results report that all wires are straight-through, re-run the Length test.
Measured lengths of wire pairs in the same cable are different	Some variation (plus or minus a few percent) is normal due to the manner in which wire pairs are twisted together in a UTP cable.

DELAY/DELAY SKEW

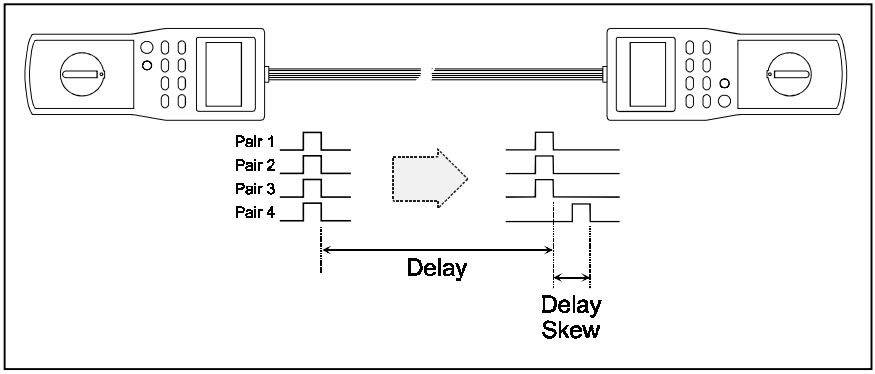


Figure 7-14. Delay/Delay Skew

Delay is a measure of the time electrical signals take to propagate from one end of the cable to the other end. The difference in propagation delays from one cable pair to another is called Delay Skew.

Delay is important for the proper operation of many Local Area Networks, particularly Ethernet. Due to the design of these networks, too much delay can result in data re-transmissions, ultimately slowing down the network.

Delay Skew is becoming increasingly important in emerging high speed Networks such as 100BaseT4, 622 Mbps ATM and Gigabit Ethernet. To transmit data at these rates, these emerging standards utilize all four cable pairs while transmitting data. In order to recombine the data at the other end of the cable, these standards require that the propagation delay of all pairs be roughly equal. If there is too much difference in delay, or Delay Skew, these LANs are unable to reconstruct the data.

Test Results	Possible Solutions
Too much Delay or Delay Skew	NVP may be incorrect. Calibrate the NVP and re-run the test. Use a higher grade cable, which typically have lower propagation delays. If your cable is identified as 2+2 or 3+1 cable, it may be resulting in excessive Delay Skew. Contact your cable manufacturer.

NOISE

Noise is defined as unwanted signals on the segment. Due to the construction of UTP cable, it acts as an antenna to electromagnetic and radio frequency signals (refer to Figure 7-15). Examples of noise producers are fluorescent lights, electric motors, power lines, signals caused by voice lines sharing the same pathway as a data line, elevators, and industrial type equipment.

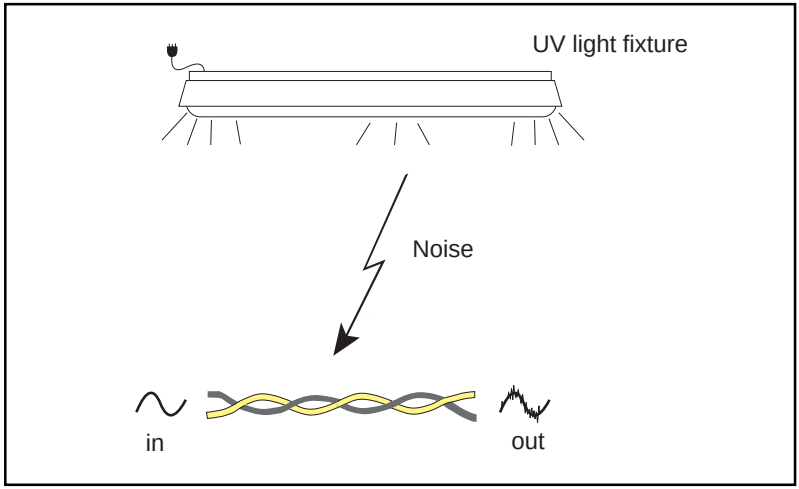


Figure 7-14. Noise

The IEEE 802.3 standard for 10BASE-T includes an impulse noise specification. If you have selected 10BASE-T as the cable test standard when performing a noise test, the 802.3 requirements are used for pass/fail criteria. For all other selected cable test standards, noise will be measured but will not be judged as pass or fail.

The following table discusses some of the common sources of noise and their solutions.

Common Causes of Noise	Solution
Electric motors	Re-route the cable and/or follow your installation specification. If in an extremely noisy environment, it may be necessary to choose an alternate media instead of UTP (for example, coax, fiber, etc.).
Light fixtures	Same as for electric motors.
Power lines	Same as for electric motors.
RF interference	Same as for electric motors.
Data lines are shared with voice lines	Keep data lines separate from voice lines. Re-route voice lines to a different cable.

The following table discusses some common noise problems and their solutions.

Test Results	Possible Solutions
Fails noise (10BASE-T) from one end, but not the other, or noise is much greater measured from one end than from the other	The cause of the noise is closer to one end than the other. Perform a LENGTH test from the end that detects the noise to determine if there is an anomaly present. Follow the segment from the end noise was detected and look for "*Common Causes of Noise*."

IMPEDANCE

Impedance is an inherent characteristic of the cable, and is a measure of resistance to AC current flow (high frequency signals) by a long cable. High speed data transmission systems will not perform well unless cabling having the correct impedance is installed. Impedance is not the same as Resistance (see Resistance below).

Do not mix cables with different impedances. Locations of any significant impedance changes can be found by performing the Length test on a segment. Refer to the previous section on Length for more information on finding impedance changes or anomalies.

Test Results	Possible Solutions
Impedance is out of specification	Check specifications of cable. Compare expected value with measured value. Make sure you are using the correct cable test standard.
Impedance is failing, but the cable is the correct type	Check for split pairs. Correct wiring as necessary.

RESISTANCE

Resistance is defined as an electrical element that impedes the flow of DC current. It is measured in ohms. As a test, it is used to confirm there are no poor connections that add to the resistance of the segment. Also, if the resistance is not within the specification, the problem may also show up as excessive attenuation and/or as an impedance anomaly.

Although the LANcat uses TDR to measure length, Resistance can also be used as a method to measure the length of a cable if you know the rated resistance (ohm per foot or meter) of the cable. Resistance of a cable is usually rated on a per 1000 feet or 1 km basis.

The following table discusses some common resistance problems and solutions.

Test Results	Possible Solutions
Resistance is out of specification	Compare measured value with expected value. Troubleshooting resistance should be performed similar to that of Attenuation. See section on Attenuation. All termination points should be checked. Perform a Length test to check for anomalies.

Testing Tips

SELECTING PERFORMANCE MODULE (PM) AND CABLE SPECIFICATION

1. Select and install the appropriate Performance Module PM for the type of cable under test.
2. Select the correct cable test standard you wish to test to.

If you select one of the EIA/TIA Category 3, 4, or 5 Basic Link test standards, the accuracy (Level I or Level II) will be determined by the Performance Module you use.

Level II measurement accuracy can only be assured with the use of the 8-position modular plug PM. See Appendix A, Test Standards for more explanation of the EIA/TIA TSB-67 Link Performance Standard.

CONNECTING THE SEGMENT UNDER TEST

CAUTION

If you see and/or hear an OVERVOLTAGE WARNING when connecting to a patch panel or wall plate, disconnect the unit immediately.

You may have connected to a telephone line carrying ringing voltages.

The LANcat is designed with special protection circuitry that allows it to withstand ringing voltages with no damage. However, it is best to avoid connecting the LANcat to live circuits.

1. When connecting to unidentified twisted pair cable, ensure there are no voltages on the segment. Use a tone tester or voltmeter to determine that there are no voltages on the wire.

2. Connect the remote unit to one end of the cable. Connect the main unit to the other end.

SELECTING THE PROPER TEST

Autotest should be used for all certification testing. Autotest verifies all twisted pair cable parameters meet the requirements of the cable specification selected. Autotest is also the only test other than Ethernet Traffic that can be saved for later printing.

The purpose of the Quick Check is to ensure there are no gross errors before running the longer Autotest. If there is a gross error (for example, split pair, OPEN, segment too long), you can fix the error before running the extended certification test, thus saving time.

You cannot use the Quick Check for certification testing because it does not make all the measurements necessary to ensure EIA/TIA compliance. The Quick Check was only designed as a quick test.

When testing UTP segments, the EIA/TIA Link Performance standard requires that you test NEXT from both directions. Because the link is not end-for-end symmetrical, NEXT will be different on each end. By testing from both directions, you can ensure no cable faults were missed.

If you suspect that you have a noise problem, check it from both ends of the cable.

INTERPRETING RESULTS

1. When testing a segment with multiple errors, do not try to interpret all the results. Start with the most obvious problem, correct it and then re-run the test. You may see multiple faults go away by correcting one fault. For example: Your test results show a split pair message and that the characteristic impedance failed. If you correct the split pair problem first (because it is the easiest problem to troubleshoot), you may find that you have also corrected the characteristic impedance problem.
2. If any of the tests you perform using the LANcat fail, use the information from the troubleshooting tables provided earlier in this chapter to determine the cause of the failure.
3. If the LANcat displays results you did not expect, make sure you document the result and/or save the test for later printout. Then, if you are unable to resolve your problem, contact Datacom Textron's Technical Support department at the numbers listed in Chapter 11, Technical Support and Service.
4. Finally, if you would like additional information on troubleshooting LANs, you may wish to order a copy of the book Troubleshooting A LAN Made Easy, from Datacom Textron.

8. SETUP

The following table provides information about the functions available under the SETUP dial position. The table details the softkey operations, the selections available for each setup parameter and factory-set default values.

Table 1. SETUP Functions

Function	Softkey Operations	Available Selections (Default is bold)
Units	Feet, Meters	**Feet** or Meters
Fault Thresh	Default, Dec, Inc	4% to 10% (**7%**)
Noise Thresh	Default, Dec, Inc	100 mV to 500 mV (**260 mV**)
PowerDown	Dec, Inc	2 to 30 min or disabled (**5 min**)
BackLight	Dec, Inc	15 seconds to 10 min (**1 min**)
Power Frequency	50 Hz or 60 Hz	50 Hz, 60 Hz
Baud Rate	Dec, Inc	1200 to 38400 baud (**9600 baud**)
Flow Control	None, Xon/Xoff, Hardware	None, Xon/Xoff, **Hardware**

Function	Softkey Operations	Available Selections (Default is bold)
Date	Format, Month, Day, Year	**mm/dd/yy** dd/mm/yy yy/mm/dd
Time	Hour, Minute, Zero Seconds	hh:mm:ss (24-hour mode only)
Audible Tone	On, Off	**On,** Off
TRAF/NOISE Tones	On, Off	On, **Off**
Company name	MODIFY Left, Right Previous, Next	**Co.** A-Z, a-z, 0-9, - , . / ( ) + * & # *Blank*
Circuit Names	*Blank*, None, Same, NEXT	*Blank*, None, **Same**, NEXT
Auto Toner	ON, OFF	ON, **OFF**
Reset to defaults	SetUp, NVPs	SetUp, NVP

NOTE

Display contrast can be adjusted as follows:

Hold the backlight button down while pressing the arrow keys, until the contrast is set for comfortable viewing.

Changing SetUp Parameters

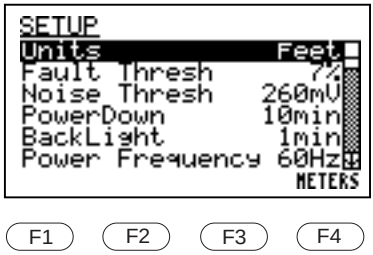
NOTE

Changes to the setup parameters are automatically stored in non-volatile memory. SetUp settings are not lost when replacing instrument batteries.

LENGTH MEASUREMENT UNITS

The Units parameter selects feet or meters for cable length measurements.

- Switch dial to SETUP.
- Highlight Units using the arrow keys.
- Press FEET/METERS (F4) to change length units.

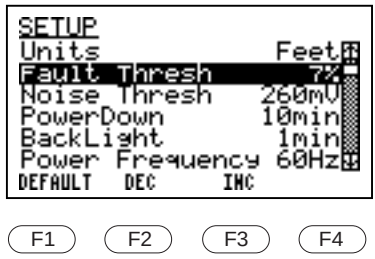


FAULT THRESHOLD

Fault Threshold is the minimum reflection level detected as an anomaly in the Length test. Any reflection less than this threshold will be ignored by the LANcat.

The default Fault Threshold value is 7%, which corresponds to the worst-case allowable impedance discontinuity specified in IEEE 802.3 for coaxial cable. Anomalies that are greater than this threshold may impair network transmission.

- Switch dial to SETUP.
- Highlight Fault Thresh using the arrow keys.
- Press DEFAULT (F1) to change to the factory default value.
- Press DEC (F2) to decrease the fault threshold.
- Press INC (F3) to increase the fault threshold.

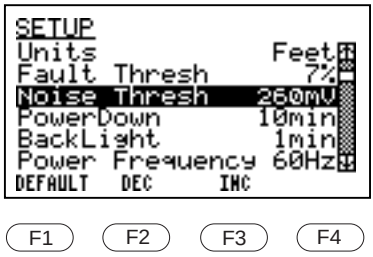


NOISE THRESHOLD

Noise Threshold is the minimum detection level for noise impulse spikes measured in the Noise test.

The default Noise Threshold value is 260 mV, which corresponds to the impulse noise specification for 10BASE-T.

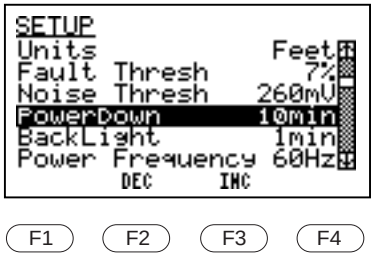
- Switch dial to SETUP.
- Highlight Noise Thresh using the arrow keys.
- Press DEFAULT (F1) to change to the factory default value.
- Press DEC (F2) to decrease noise threshold.
- Press INC (F3) to increase the



POWER DOWN TIME

Power Down sets the time interval for the LANcat automatic powers down. The LANcat will power down after the time interval during which there has either been no key press or no communication with the other end when set to Remote mode. To disable Power Down, set the value to Disabled.

- Set dial to SETUP.
- Highlight PowerDown using the arrow keys.
- Press DEC (F2) to shorten the time until power down.
- Press INC (F3) to lengthen the time until power down.



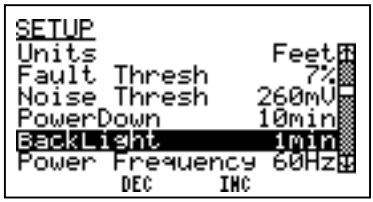
CAUTION

Auto power down is automatically disabled during the Traffic and Noise tests. Use the AC/mains adapter to power the LANcat for extended Traffic or Noise monitoring.

BACKLIGHT TIME

The Backlight parameter sets the “on” time for the display backlight. The backlight should be used sparingly as it reduces the number of operation hours on a set of batteries or a battery charge.

- Set dial to SETUP.
- Highlight BackLight using the arrow keys.
- Press DEC (F2) to shorten the time that the backlight remains on.
- Press INC (F3) to lengthen the time that the backlight remains on.

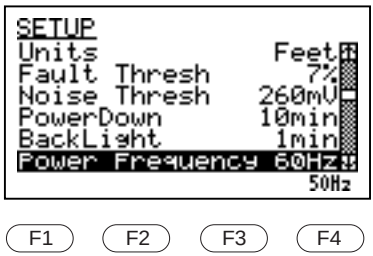


POWER FREQUENCY

The Power Frequency parameter is used to set the LANcat with the frequency of the local AC/mains power source.

Proper setting of Power Frequency will avoid display flicker caused by the interaction of the LCD display with room light sources. It is also used to filter noise from some measurements.

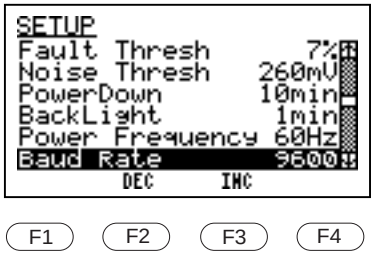
- Set dial to SETUP.
- Highlight Power Frequency using the arrow keys.
- Press 60Hz/50Hz (F4) to change the power frequency setting.



BAUD RATE

The Baud Rate matches the LANcat serial output baud rate with that of the printer or PC. The default setting is 9600 baud, which is the most common serial printer input baud rate.

- Set dial to SETUP.
- Highlight BAUD RATE using the arrow keys.
- Press DEC (F2) to decrease the baud rate.
- Press INC (F3) to increase the baud rate.



FLOW CONTROL

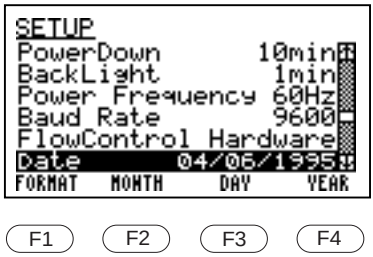
Flow Control determines what method is used to control data flow between the LANcat and the printer or PC. The default setting is the HARDWARE flow control setting. Other available settings are: XON/XOFF, and NONE.

- Set dial to SETUP.
- Highlight FLOW CONTROL using the arrow keys.
- Press HARDWARE (F4), XON/XOFF (F2), or NONE (F1)

DATE

The LANcat records the date that a test report is saved and includes this date on output test reports. There are three available date formats: mm/dd/yy (default), dd/mm/yy, or yy/mm/dd.

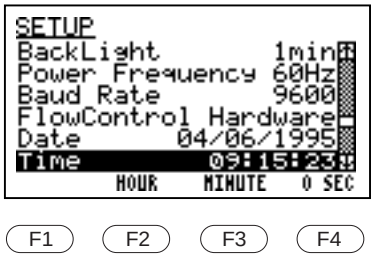
- Set dial to SETUP.
- Highlight Date using the arrow keys.
- Press FORMAT (F1) to change the date format.
- Press MONTH to change the month.
- Press DAY to change the date.
- Press YEAR to change the year.



TIME

A 24-hour time clock is maintained in the LANcat. Use the 0 SEC (F4) softkey to zero the seconds.

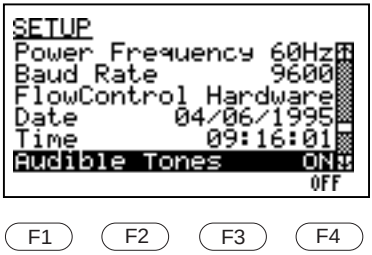
- Set dial to SETUP.
- Highlight Time using the arrow keys.
- Press HOUR (F2) to change the hour.
- Press MINUTE (F3) to change the minutes.
- Press 0 SEC (F4) to zero the seconds.



AUDIBLE TONES

Audible Tones parameter enables and disables audible tones that are created at the end of tests, and that are generated during Traffic and Noise tests. A different audible tone is created for Pass and Fail test results.

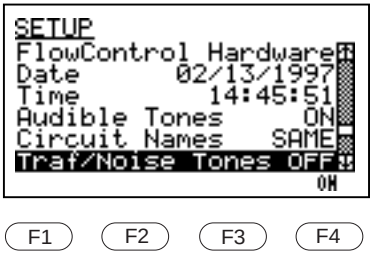
- Set dial to SETUP.
- Highlight Audible Tones using the arrow keys.
- Press ON /OFF (F4) to enable or disable the tones.



TRAFFIC/NOISE TONES

Traffic/Noise Tones parameter enables and disables audible tones that are generated during Traffic and Noise tests as activity indicators. Traffic/Noise tones are automatically disabled when the Audible Tones parameter is disabled.

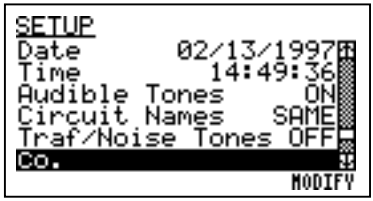
- Set dial to SETUP.
- Highlight Traffic/Noise Tone using the arrow keys.
- Press ON /OFF (F4) to enable or disable the tone.



COMPANY NAME

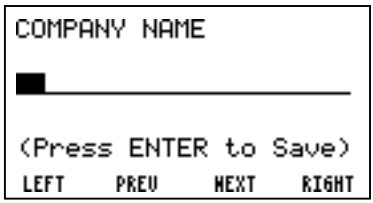
Test reports can be customized to include a company name up to 20 characters long.

- Set dial to SETUP.
- Highlight CO. using the arrow keys.
- Press MODIFY (F4) or ENTER to modify the name.



F1 F2 F3 F4

- Press LEFT (F1) or RIGHT (F4) to move the cursor.
- Press PREV (F2) or NEXT (F3) to enter alpha or numeric characters. Hold down the softkey to accelerate scrolling of characters.
- Press ENTER to save the new name.

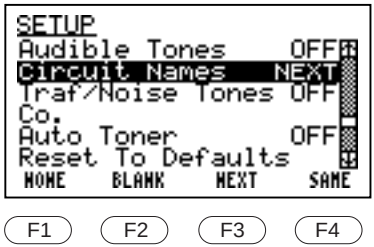


F1 F2 F3 F4

CIRCUIT NAMES

The Circuit Names setting determines the default name used for the circuit identification when saving Autotest results.

- Set dial to SETUP.
- Highlight Circuit Names using the arrow keys.
- Press NONE (F1), BLANK (F2), NEXT (F3) or SAME (F4).



NONE: No Circuit ID is allowed. Reports are identified only by number.

BLANK: User can enter Circuit ID starting with nothing.

SAME: User can enter Circuit ID starting with the last ID used.

NEXT: User can enter Circuit ID starting with the last ID used but with the last character "incremented".

NOTE

The string length is not changed on overflow but the character to the left is "incremented". Letters increment to letters (...XYZABC...) and numbers increment to numbers (0123456789012...).

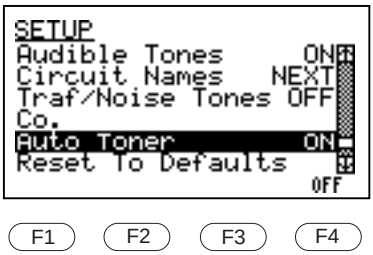
Example Sequences:

ID-ABY	ID-AB2
ID-ABZ	ID-AB3
ID-ACA	⋮
	ID-AB9
	ID-AC0

AUTO TONER

Setting Auto Toner ON activates the Cable Toner feature whenever the unit is set to Quick Check or Autotest and a remote is not attached. (See Chapter 5).

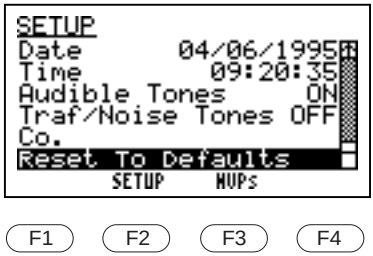
- Set dial to SETUP .
- Press ON/OFF (F4) to enable or disable automatic tone generation.



RESET TO DEFAULTS

The Reset to Defaults parameter allows you to return the LANcat internal settings to their factory default settings.

- Set dial to SETUP.
- Highlight Reset to Defaults using the arrow keys.
- Press SETUP (F2) to reset all setup parameters to their default values (refer to Table 8-1).
- Press NVPs (F3) to reset all NVP values to their default values as shown in Appendix B.



9. CALIBRATION AND UPGRADING

The LANcat performs several types of calibrations: NVP calibration, Remote Unit calibration, Performance Module calibration, Impedance calibration, Resistance calibration, and main unit calibration.

NVP Calibration

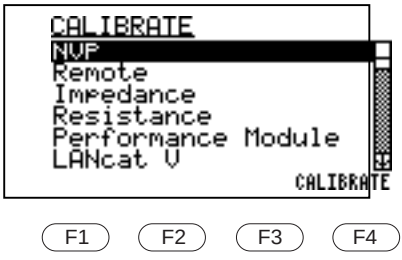
A default Nominal Velocity of Propagation (NVP) value is preselected in the LANcat depending on the cable test standard selected. More precise NVP values can be set using one of the following procedures. NVP calibration using a section of the actual cable to be tested is the more accurate of the two procedures.

USING A KNOWN LENGTH OF CABLE

To measure and save the NVP of a known length of cable, perform the following steps.

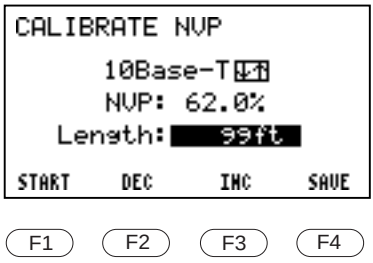
1. Set the dial to CAL.
2. Select NVP from the calibration menu and press CAL (F4) or ENTER.
3. Press arrow keys to change the cable test standard and press SAVE (F4) or ENTER.

Calibrate NVP



4. Connect a known length of sample cable to the LANcat. The cable must be at least 50 feet (15 meters) long to get an accurate measurement (longer lengths improve accuracy). Leave the far end of the cable open.
5. Press START(F1).
6. Press DEC (F2) or INC (F3) to adjust the cable length on the display to the known cable length.

Entering Cable Length



7. Press SAVE (F4) or ENTER to save the new value.
8. To repeat, press Start (F1).
9. Press ESC to exit the NVP calibration mode.

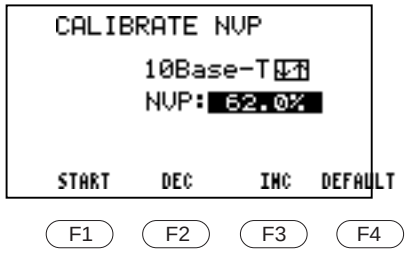
USING MANUFACTURER'S CABLE SPECIFICATIONS

If you do not have a known length of cable available, but can identify the cable manufacturer and part number, you may be able to determine the rated cable NVP and load that NVP value into the LANcat. Many common cable NVPs are listed in Appendix B, Common NVP Values.

To load a known NVP value:

1. Set the dial to CAL.
2. Select NVP from the calibration menu and press CALIBRATE (F4) or ENTER.

Entering a Known NVP Value



3. Press INC (F3) or DEC (F2) to adjust the NVP value.
4. Press ENTER to save the new NVP value. A message indicates that the new value has been entered.
5. Press ESC to exit the NVP calibration mode.

Why do I need to set cable NVP?

In order to make accurate cable length measurements, the correct cable Nominal Velocity of Propagation (NVP) value must be set in the LANcat. The NVP is a measure of how fast an electrical pulse travels down a cable compared to the speed of light.

NVP is expressed as a percentage and is usually between 50% and 90%. A default NVP value is automatically set by the LANcat based upon the cable test standard selected.

Using the default value, however, may result in cable length measurement errors of up to 7% due to the variation in the signal propagation rate from cable to cable. This potential length error usually will not impair troubleshooting of a prior working cable segment unless the length measurement of a cable is close to the test limit (for example 100 meters on a 10BASE-T segment).

When using the LANcat for cable certification, determine the true cable NVP and save the value. This will ensure the most accurate cable length measurements and will avoid failing cable segments that are close to the test limit.

Remote Unit Calibration

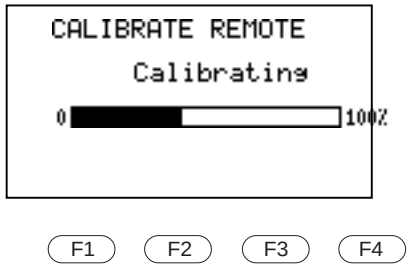
Remote Unit calibration should be performed on a periodic basis in order to maintain the accuracy of attenuation measurements. Remote calibration is most sensitive to temperature changes. Allow both main and Remote units to stabilize to their operating environment before performing the calibration procedure. Remote Unit calibration should also be performed following every Performance Module change. Remote calibration is unique to the Remote unit used. Calibration should be performed whenever a different Handheld/Remote combination is used.

ONE-WAY SYSTEM CALIBRATION

To calibrate the remote on a OneWay System:

1. Connect the Remote to the LANcat using the Modular Plug Performance Module. Attach the modular plug directly to the Remote Unit. When using the Modular Jack Performance Module, use the supplied four foot (1.2 meter) Category 5 patch cord.
2. Set the dial to CAL.
3. Highlight Remote in the Calibrate menu by using the arrow keys.
4. Press CALIBRATE (F4) or ENTER.
5. When finished, the screen returns to the Calibrate menu.

Calibrating the Remote Unit



TWO-WAY SYSTEM CALIBRATION

To calibrate the remote unit on a TwoWay System:

1. Connect the main unit to the CAT 3 calibration coupler, using the modular plug Performance Module. (If you are using the modular jack Performance Module, use the four-foot CAT 5 patch cord).
2. Connect remote unit to the open end of the CAT 3 calibration coupler using the Modular Plug Performance module.
3. Set the remote unit's dial to Remote.
4. Set the main unit's dial to CAL.
5. Highlight Remote in the Calibrate menu.
6. When the test is finished, the screen returns to the Calibrate menu.
7. Turn the dial to Quick ✓. Press the UP or DOWN arrow keys to highlight the CAT5 Basic Link test standard. Press ENTER or SAVE (F4) to select the standard. The unit will then perform a QUICK CHECK test.
8. Once the test is complete, press VIEW (F3). Press the up or down arrow key until the Attenuation results are displayed. The Attenuation results should display values greater than 0.0 dB. If 0.0 dB is displayed for any or all pairs, perform the Remote Calibration again.

NOTE

In order to ensure correct calibration, be sure to switch the roles of both units, and repeat the procedure above.

Performance Module Calibration

Each Performance Module used with the LANcat needs to be calibrated in order to deliver maximum measurement accuracy. LANcat automatically recognizes which type of Performance Module is installed, and can store a set of calibration parameters for each Performance Module type in non-volatile memory. It is therefore possible for the LANcat to be calibrated to a number of Performance Modules at the same time, provided that they are different types. For example, the LANcat can be calibrated to both a Modular Plug module and a Modular Jack module, thus allowing change from one Performance Module to the other without need for recalibration. If a Performance Module is replaced with another of the same type, however, calibration of the new Performance Module should be performed.

A Calibration Standard is available for convenient field calibration of twisted pair Performance Modules. This Standard also enables you at any time to perform a "confidence check" on the proper operation of a Performance Module by repeating the calibration procedure.

To calibrate a Performance Module:

NOTE

Press ESC at any time to cancel the calibration procedure.

1. Set the dial to CAL.
2. Highlight PERFORMANCE MODULE in the Calibrate menu using the arrow keys.
3. Press CALIBRATE (F4) or ENTER. The CALIBRATE PERFORMANCE MODULE screen will appear with the displayed message "Connect To JACK 1".

4. Connect the LANcat to JACK 1 of the Calibration Standard. (Use the supplied Category 5 Patch Cord for connecting a Modular Jack Performance Module to the Calibration Standard).
5. Press START (F4) or ENTER. The message "CALIBRATING..." will be displayed on the screen. The bar graph across the bottom of the display will show the progress of the calibration. Press CANCEL (F1) or ESC to cancel the calibration procedure.
6. After approximately 45 seconds, the LANcat will display the message "Connect To JACK 2". Remove the plug from JACK 1 and insert it into JACK 2.
7. Press CONTINUE (F4) or ENTER. The message "CALIBRATING..." will be displayed and the bar graph across the bottom of the display will show the progress of the calibration. Press CANCEL (F1) or ESC to cancel the calibration procedure.
8. After approximately 45 seconds, the LANcat will display the message "Connect To JACK 3". Remove the plug from JACK 2 and insert it into JACK 3.
9. Press CONTINUE (F4) or ENTER. The message "CALIBRATING..." will be displayed and the bar graph across the bottom of the display will show the progress of the calibration. Press CANCEL (F1) or ESC to cancel the calibration procedure. When finished, the screen returns to the CALIBRATE menu.

NOTE

If at any time during the above procedure an error message is displayed on the screen, start at the beginning of the instructions and attempt the calibration again. If the problem continues, contact Datacom Textron Technical Support.

Impedance Calibration

Impedance calibration should be performed on a periodic basis in order to maintain maximum accuracy. Impedance calibration is most sensitive to temperature changes. Allow the main unit to stabilize to the operating environment before performing the calibration procedure. Calibration should be performed whenever a different Performance Module is installed.

To calibrate Impedance:

1. Set the dial to CAL.
2. Highlight Impedance in the Calibrate menu by using the arrow keys.
3. Press CALIBRATE (F4) or ENTER. The Calibrate Impedance screen will appear with the displayed message "Connect to Jack 1".
4. Connect the LANcat to JACK 1 of the Calibration Standard. (Use the supplied Category 5 Patch Cord for connecting a Modular Jack Performance Module to the Calibration Standard).
5. Press START (F4) or ENTER. The message "CALIBRATING..." will be displayed on the screen. The bar graph across the bottom of the display will show the progress of the calibration. Press CANCEL (F1) or ESC to cancel the calibration procedure.
6. When finished, the screen returns to the CALIBRATE menu.

Resistance Calibration

Resistance calibration should be performed on a periodic basis in order to maintain maximum accuracy. Resistance calibration is most sensitive to temperature changes. Allow the main unit to stabilize to the operating environment before performing the calibration procedure. Calibration should be performed whenever a different Performance Module is installed.

To calibrate Resistance:

1. Connect the LANcat to the Remote Unit.
2. Set the dial to CAL.
3. Highlight Resistance in the Calibrate menu by using the arrow keys.
4. Press CALIBRATE (F4) or ENTER. The Calibrate Resistance screen will appear. The bar graph across the bottom of the display will show the progress of the calibration.
5. When finished, the screen returns to the CALIBRATE menu.

Main Unit Calibration

This calibration mode is only intended at this time for factory use.

Upgrading the LANcat

Periodically, new performance capabilities will be made available as upgrades to the LANcat. Hardware performance upgrades will be made possible with new Performance Modules. Software (firmware) upgrades will be made possible through software (firmware) updates.

LANcat software (firmware) is available over the Internet at *www.datacom.textron.com*. Those without a means to access the Internet may contact Datacom Textron's Technical Support Center for software (firmware) upgrades.

Firmware updates are available as a self-extracting executable file. Follow the directions in README.TXT to load the update. Directions may also be found in your Report Manager User Manual on pages 10 and 11. Report Manager User Manuals are available from Datacom Textron Technical Support Center.

CAUTION

Updating of the LANcat software (firmware) will erase all stored test results. Be sure to print stored test results or upload them to a PC before upgrading the LANcat.

10. ETHERNET TRAFFIC ANALYSIS

Traffic provides a report of Ethernet network utilization and activity.

The LANcat monitors live traffic on 10BASE-T Ethernet networks and continuously displays the percentage of network utilization, peak traffic, and collisions on the screen along with a bar graph display of network activity. An audio tone provides feedback of network activity.

Test results are saved in the LANcat's memory and can be printed when the test is completed. The printout includes a graph of network activity over time showing average utilization, peak utilization, percentage of collisions, packet counts, and jabber conditions. For 10BASE-T networks, the LANcat automatically generates link pulses to activate the hub and reports whenever a link state with the hub is lost.

Because the Traffic test runs continuously, use the AC/mains adapter if the test is to be run for an extended period.

The Traffic test of the LANcat reports:

- **Network utilization percentage**
- **Peak traffic**
- **Collisions**

The Traffic test also detects

- **Jabber**
- **Loss of link connections (10BASE-T)**
- **Wrong polarity**

Running Traffic Test

1. Connect the LANcat directly to the network either at the 10BASE-T hub or at the end of a cable segment.
2. Switch dial to TRAFFIC.
3. Press arrow keys to change the cable test standard and SAVE (F4) or ENTER to select a cable test standard.
4. Press ENTER to clear the last Traffic test from memory and start a new test.

CAUTION

Auto power down is disabled during the Traffic test. It is advised to use the AC/mains adapter to power the LANcat for extended Traffic monitoring.

Viewing Traffic Results

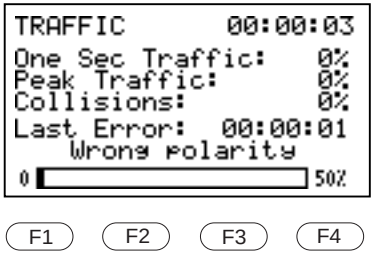
The screen displays a continuous reading of traffic conditions on the network.

FEATURE	DESCRIPTION
One Sec Traffic	• Shows the average network utilization over the last second. Average traffic utilization over 30-40% indicates a heavily loaded network.
Peak Traffic	• The highest one-second average traffic over the duration of the test.
Collisions	• Shows the current collisions rate over the last second, expressed as a percentage of total packets transmitted. Collisions are counted when runt packets (shorter than a valid minimum packet length) are detected. • Collision rates exceeding 3% may indicate a faulty station, network interface card, or an excessively long cable segment.
Last Error	• Identifies detected transmission errors and the time since the last error ended in hours, minutes and seconds.
Error Since	• Identifies detected transmission errors and the time the error started in hours, minutes, and seconds.
Bar Graph	• Displays the current traffic level, scaled from 0 on the left to 50% on the right side of the display.

Traffic test can detect the following three errors:

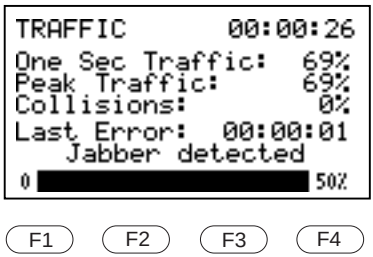
ERROR	DESCRIPTION
No Link Pulse	- Indicates that there were no Link pulses received from the 10BASE-T hub, possibly as a result of a faulty hub or cable link connected to the hub.
Wrong polarity	- Indicates possible miswire of cable link or hub port caused by tip/ring reversal on a wire pair.
Jabber	- Indicates illegal packet length of greater than 20 ms was received. This suggests a faulty network interface card.

Traffic Test Results Screen (Wrong Polarity)



Traffic Test Results Screen (No Link Pulse)

Traffic Test Results Screen (Jabber Detected)



NOTE

The "Error Since" message indicates the time when the present traffic error began. The "Last Error" message indicates the time when the last error occurred. There is no current error present.

11. TECHNICAL SUPPORT AND SERVICE

Datacom Textron offers unlimited free technical support for your LANcat. If you have questions or comments about your cable tester, contact your sales representative, distributor, or call Datacom Textron and ask for technical support. Hours are Monday through Friday, 8 AM to 4:30 PM Pacific Time. The phone numbers and Internet address are:

US and Canada	800-468-5557
	425-355-0590
International	425-355-0590
FAX	425-290-1600
Internet	www.datacom.textron.com

You may wish to e-mail your question to our web site. A Datacom Textron Technical Support Representative will review all messages received and reply appropriately.

The FAX and web site operate 24 hours a day.

LANcat Self Test

If the LANcat fails to operate as expected, or exhibits inaccurate readings, you should perform a Selftest.

To run Selftest:

1. Set dial to EXTENDED FUNCTIONS.
2. Press arrow keys to highlight Selftest.
3. Press ENTER. The test begins immediately and a screen displays showing the test results.

If the Selftest fails, make a note of which test fails and contact a Datacom Textron Technical Support Representative.

If the LANcat passes the Selftest, but still does not perform properly, perform the calibration procedure (refer to Chapter 9, Calibration) then perform the System Integrity Pretest described in Chapter 2. If you continue to experience problems, make a note of the circumstances and print a cable report, if applicable. Then call Datacom Textron Technical Support.

You must obtain a Return Material Authorization (RMA) number before sending an instrument in for repair.

APPENDIX A. TEST STANDARDS

The LANcat tests cabling to the performance required by the cable test standard chosen. The test limits for each specification standard are listed in the following tables.

LANcat cable test standards may be modified to add/remove cable tests (e.g. cable resistance) and modify which pairs are tested. See Defining Custom Standards.

Installed Link Test Configuration

Cabling system performance requirements have been established by the industry association, EIA/TIA in Technical Systems Bulletin 67. TSB-67 also defines two installed cabling test configurations, the Channel and the Basic Link.

The primary difference between the Channel and the Basic Link configurations is that the Channel includes the user's patch cords and equipment cords used to connect to the workstation (at the office end) and to the communications distribution equipment/hub (at the wiring closet). The Basic Link excludes the user's patch cords and equipment cords.

Channel Testing

The Channel wiring system is encountered when the need arises to diagnose system problems in existing networks.

TWO-WAY SYSTEM CHANNEL TESTING

The following figure illustrates a typical test set up using a TwoWay System to test a Channel:

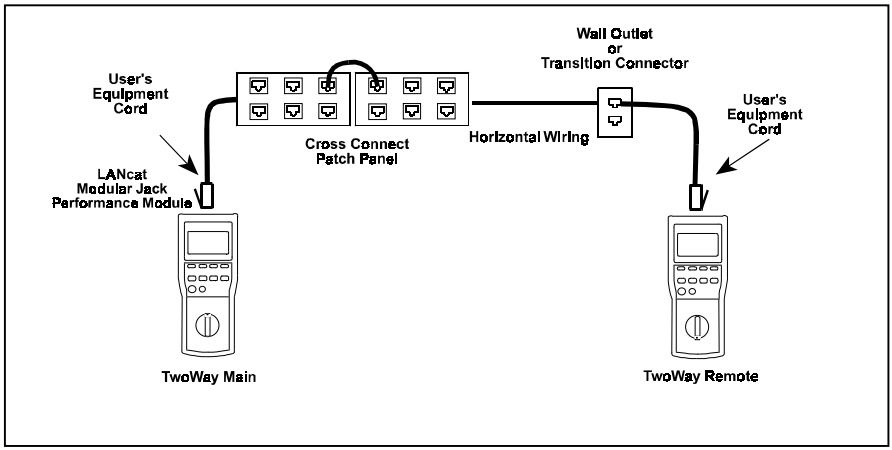


Figure A-1. Channel Test Configuration, Two Way System

ONE-WAY SYSTEM CHANNEL TESTING

The following figure illustrates a typical test set up using a OneWay System to test a Channel:

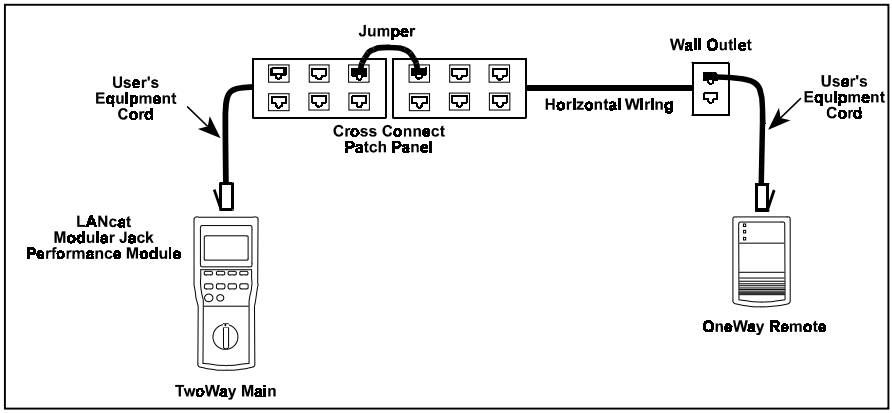


Figure A-2. Channel Test Configuration, One Way System

Basic Link Testing

The Basic Link wiring system is encountered when a new installation is to be certified for conformance to the cabling system performance requirements of TSB-67. The Modular Plug Performance Module is used in this arrangement.

TWO-WAY SYSTEM BASIC LINK TESTING

The following figure illustrates a typical test set up using a TwoWay System to test a Basic Link:

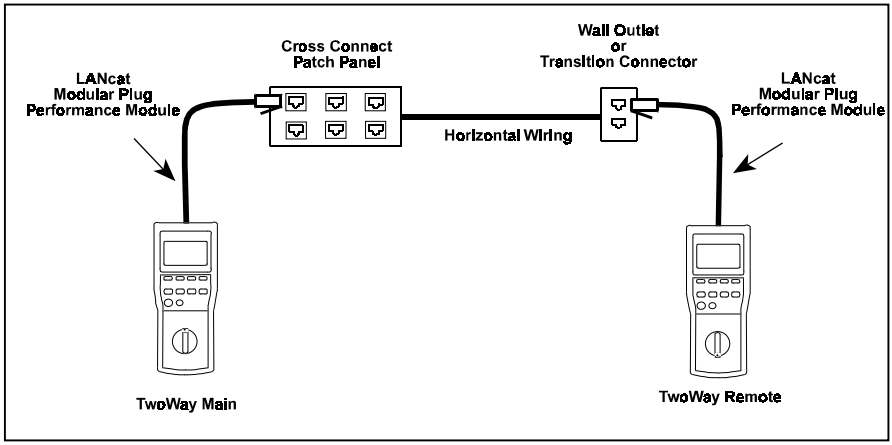


Figure A-3. Basic Link Test Configuration, Two Way System

ONE-WAY SYSTEM BASIC LINK TESTING

The following figure illustrates a typical test set up using a OneWay System to test a Basic Link

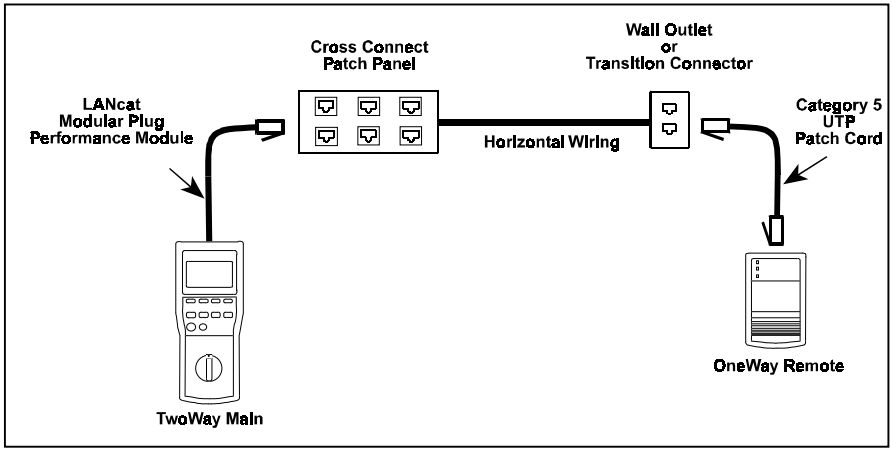


Figure A-4. Basic Link Test Configuration, One Way System

EIA/TIA TSB-67 - Test Limits

When testing to Category 3, Category 4, or Category 5 UTP limits, the cable category as well as the Cable Test Configuration is chosen from the Cable Test Standards menu. To test the Channel, including user patch and equipment cords, use the Modular Jack Performance Module. The Basic Link can be tested to Level I accuracy with the Modular Jack Performance Module or it can be tested to Level II accuracy with the Modular Plug Performance Module. (Level II is higher in performance than Level I. It is not possible to attain Level II accuracy using the Modular Jack Performance Module).

Table 1. Attenuation

Frequency MHz	Category 3 (dB)		Category 4 (dB)		Category 5 (dB)	
	Channel	Link	Channel	Link	Channel	Link
1.0	4.2	3.2	2.6	2.2	2.5	2.1
4.0	7.3	6.1	4.8	4.3	4.5	4.0
8.0	10.2	8.8	6.7	6.0	6.3	5.7
10.0	11.5	10.0	7.5	6.8	7.0	6.3
16.0	14.9	13.2	9.9	8.8	9.2	8.2
20.0			11.0	9.9	10.3	9.2
25.0					11.4	10.3
31.25					12.8	11.5
62.5					18.5	16.7
100.0					24.0	21.6

Table 2. NEXT

Frequency MHz	Cat 3 (dB)		Cat 4 (dB)		Cat 5 (dB)	
	Channel	Link	Channel	Link	Channel	Link
1.0	39.1	40.1	53.3	54.7	>60.0	>60.0
4.0	29.3	30.7	43.3	45.1	50.6	51.8
8.0	24.3	25.9	38.2	40.2	45.6	47.1
10.0	22.7	24.3	36.6	38.6	44.0	45.5
16.0	19.3	21.0	33.1	35.3	40.6	42.3
20.0			31.4	33.7	39.0	40.7
25.0					37.4	39.1
31.25					35.7	37.6
62.5					30.6	32.7
100.0					27.1	29.3

Table 3. CAT3, CAT4, and CAT5 Pass/Fail Limits

Length	Channel: ≤ 100 meters Link: ≤ 94 meters
Characteristic Impedance	100 $\pm$ 25 Ω
Split Pair	NEXT < 20 dB (8 - 10 MHz)
Resistance	<9.9 Ω

ISO/IEC - Test Limits

Cabling System performance criteria have been established Internationally by the ISO/IEC Standards body in the ISO/IEC 11801 Standard. The 11801 Standard establishes two applications referred to as Class C and Class D. Cabling Links supporting Class C applications are specified up to 16 MHz. Cabling Links supporting Class D applications are specified up to 100 MHz.

When testing to Class C or Class D limits, use of the Modular Plug Performance Module is recommended. If testing of the user patch cords is required, the Modular Jack Performance Module can be used with reduced accuracy performance.

NOTE

ScTP Class D and ISO 11801 Class D are equivalent, with the exception that ScTP requires shield continuity.

Table 4. ISO/IEC 11801 Pass/Fail Limits

Frequency (MHz)	Maximum attenuation values (dB)		Minimum NEXT loss (dB)	
	Class C	Class D	Class C	Class D
1.0	3.7	2.5	39	54
4.0	6.6	4.8	29	45
10.0	10.7	7.5	23	39
16.0	14	9.4	19	36
20.0	N/A	10.5	N/A	35
31.25	N/A	13.1	N/A	32
62.5	N/A	18.4	N/A	27
100.0	N/A	23.2	N/A	24

Table 5. ISO 11801 Class C, Class D ACR Test Limits

Frequency (MHz)	Minimum ACR (dB)	
	Class C	Class D
1.0	35.3	-
40	22.4	40
10.0	12.3	35
16.0	5	30
20.0	-	28
31.25	-	23
62.5	-	13
100.0	-	4

Table 6. ISO 11801 Class C, Class D Pass/Fail Limits

Length	≤ 100 meters
Characteristic Impedance	100 ± 25 Ω
Split Pair	20 dB
Resistance	< 20.5 Ω

Enhanced Cable Standards – Test Limits

LANcat includes several enhanced Cable Test Standards. All enhanced cable standards are designated as “Plus” cable standards (e.g. Cat5 Plus BasicLnk. ISO Class D Plus). “Plus” cable test standards include Power Sum NEXT and Delay/Delay Skew tests along with the standard suite of tests (see Chapter 5 - Power Sum NEXT, Delay/Delay Skew). “Plus” Cable Test standards test the cable to a higher standard than the standards they are based on (e.g. Cat 5, Class D) and are intended for testing the new emerging enhanced data cable (sometimes referred to as 350 cabling).

Power Sum NEXT test limits for “Plus” cable standards are identical to the pair-to-pair test limit of the base cable standard. All other test limits are the same.

IEEE Twisted Pair – Test Limits

IEEE 802.3 and 802.5 Standards specify cabling performance required for proper operation of Ethernet and Token Ring networks, respectively. LANcat checks against the following limits when those wiring systems are invoked from the menu. These systems can be tested with either the plug or jack interfaces.

NOTE

When diagnosing wiring problems on existing Ethernet or Token Ring networks, it is appropriate to test to the IEEE standard for that particular network despite the probability that wiring originally may have been certified to some higher performance category.

The benefit of testing in this manner is that a good deal of time will be saved when diagnosing cabling performance

for the needed frequencies rather than attempting to re-certify wiring for performance that is higher than needed for the network to operate properly.

Table 7. 10BASE-T Pass/Fail Limits

Length	≤ 100 meters
Characteristic Impedance	100 ± 25 Ω
NEXT	> 31 dB @ 5 MHz >27 dB @ 8 MHz >26 dB @ 10 MHz (NEXT > 26-15log(f/10) where: f = signal frequency in MHz
Attenuation	< 11.5 dB
Split Pair	NEXT < 20 dB (8 - 10 MHz)
Resistance	<9.9 Ω

Table 8. 4 Mbps Token Ring UTP Pass/Fail Limits

Length	≤ 100 meters
Characteristic Impedance	100 ± 25 Ω
NEXT	> 31 dB @ 5 MHz >28 dB @ 8 MHz >26 dB @ 10 MHz
Attenuation	< 7 dB @ 5 MHz < 9 dB @ 8 MHz < 10 dB @ 10 MHz
Split Pair	NEXT < 20 dB (8 - 10 MHz)
Resistance	< 9.9 Ω

Table 9. 16 Mbps Token Ring UTP Pass/Fail Limits

Length	≤ 100 meters
Characteristic Impedance	100 ± 25Ω
NEXT	> 41 dB @ 5 MHz >38 dB @ 8 MHz >36 dB @ 10 MHz >33 dB @ 16 MHz >32 dB @ 20 MHz
Attenuation	< 5 dB @ 5 MHz < 6 dB @ 8 MHz < 7 dB @ 10 MHz < 9 dB @ 16 MHz < 11 dB @ 20 MHz
Split Pair	NEXT < 20 dB (8 - 10 MHz)
Resistance	< 9.9 Ω

Table 10. Token Ring STP Pass/Fail Limits

Length	≤ 100 meters
Characteristic Impedance	150 ± 25Ω
NEXT	Between 1 and 16 MHz, NEXT > 35 dB
Attenuation	Between 1 and 16 MHz, Attenuation < 8.5 dB
Split Pair	NEXT < 20 dB (8 - 10 MHz)
Resistance	< 7 Ω

Table 11. 100 Base TX Pass/Fail Limits

Length	≤ 100 meters
Characteristic Impedance	100 ± 25 Ω
NEXT	Between 1 and 100 MHz, NEXT > Category 5 Channel Limits
Attenuation	Between 1 and 100 MHz, Attenuation < Category 5 Channel Limits
Split Pair	NEXT < 20 dB (8 - 10 MHz)
Resistance	< 9.9 Ω

Table 12. 100 Base T4 Pass/Fail Limits

Length	≤ 100 meters
Characteristic Impedance	100 ± 25 Ω
NEXT	Between 1 and 16 MHz, NEXT > Category 3 Channel Limits
Attenuation	Between 1 and 16 MHz, Attenuation < Category 3 Channel Limits
Split Pair	20 dB
Resistance	< 9.9 Ω

Table 13. TP PMD and TP PMD-REV Pass/Fail Limits

Length	≤ 100 meters
Characteristic Impedance	100 ± 25 Ω
NEXT	Between 1 and 100 MHz, NEXT > Category 5 Channel Limits
Attenuation	Between 1 and 100 MHz, Attenuation < Category 5 Channel Limits
Split Pair	20 dB
Resistance	< 9.9 Ω

Table 14. FTP 120Ω Pass/Fail Limits

Length	≤ 100 meters
Characteristic Impedance	120 ± 25 Ω
NEXT	Between 1 and 100 MHz, NEXT > ISO 11801 Class D Limits
Attenuation	Between 1 and 100 MHz, Attenuation < ISO 11801 Class D Limits
Split Pair	20 dB
Resistance	< 20.5 Ω

Table 15. ATM 155 Mbps Pass/Fail Limits

Length	≤ 100 meters
Characteristic Impedance	100 Ω
NEXT	Between 1 and 100 Mhz, NEXT > Category 5 Limits
Attenuation	Between 1 and 100 Mhz, Attenuation < Category 5 Limits
Split Pair	20 dB
Resistance	< 9.9 Ω

Defining Custom Standards

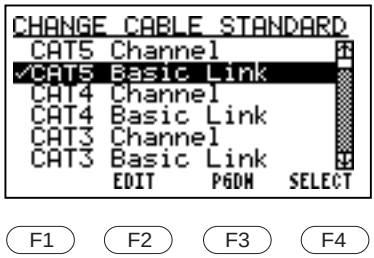
Existing cable test standards can be modified to create additional custom standards. Custom Standards that have been defined by the user are then available as a Cable Standard and are identified by an asterisk (*).

The tests performed and the PASS/FAIL limits are set by copying one of the existing cable test standards. The customization consists of selecting which pairs will be included in the tests and which tests will be performed.

To create a custom standard:

1. Set dial to Autotest, Quick ✓, Wire Map, Length or Traffic.

2. Press either arrow key to display the cable standard library.



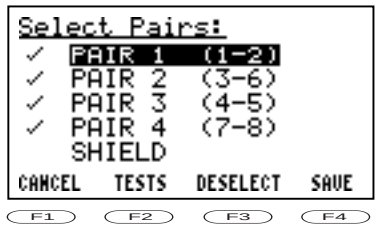
3. Select a test standard to copy for the new custom test standard, then, press EDIT (F2).

4. Press SELECT/DESELECT (F3) to choose the tests that will be performed. Press either arrow key to move up or down the list.

   Selected tests (indicated by a √ mark) will be included in the custom test.

5. Press PAIRS (F2) to select which wire pairs will be included in the tests (twisted pair cables).

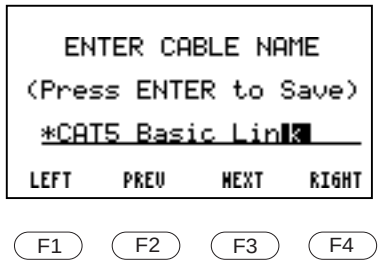
6. Press SELECT/DESELECT (F3) to choose wire pairs and shield.



7. Press SAVE (F4) to save the custom standard. To cancel, press CANCEL (F1).

8. The name of the test standard that was copied, preceded by an asterisk, will be displayed.

   If you want to change the name, move through the name with the LEFT and RIGHT keys, and select new characters with the PREV and NEXT keys.



9. Press ENTER to save the custom cable test standard.

NOTE

When using a TwoWay System, matching custom cable definitions must be created on both units.

APPENDIX B. COMMON CABLE NVP VALUES

DEFAULT NVP VALUES

The LANcat uses the following default NVP values:

Cable Test Standards	Default NVP
Category 5 Basic Link	72%
Category 5 Channel	72%
Category 4 Basic Link	66%
Category 4 Channel	66%
Category 3 Basic Link	62%
Category 3 Channel	62%
Token Ring STP	78%
Token Ring 4 UTP	60%
Token Ring 16 UTP	69%
10BASE-T	62%
100BASE-TX	72%
100BASE-T4	58%
TP-PMD	72%
TP-PMD Rev	72%
ScTP Class C	62%
ScTP Class D	72%
ATM 155 Mbps	72%
FTP 120 Ohms	72%
ISO 11801 Class C	62%
ISO 11801 Class D	72%

The following table lists the characteristic impedance and nominal NVP for several manufacturers' cable types.

Manufacturer	Part No.	Category	Impedance (•)	NVP (%)
Alpha	9304C	3	100	64
Alpha	9304F	3	100	62
AT&T	1010A	3	100	67
AT&T	2010A	3	100	70
Belden	1154A	3	100	60
Belden	1155A	3	100	62
Belden	1229A	3	100	69
Belden	1245A	3	100	69
Belden	1250A	3	100	62
Berk-Tek	LAN-Grade PL PVC	3	100	58
Berk-Tek	LAN-Grade PL FEP	3	100	72
Berk-Tek	LAN-Grade NP	3	100	69
CommScope	3504	3	100	68
Brand-Rex	CMP-00026/4F	3	100	60
AT&T	1024A	3	100	67
Alcatel	530102	3	100	65
Alcatel	230146	3	100	65
Alpha	9404C	4	100	67
Alpha	9404F	4	100	73
AT&T	2041A	4	100	75
Belden	1455A	4	100	72
Belden	1457A	4	100	75
Belden	1555A	4	100	72
Belden	1456A	4	100	71
Belden	1458A	4	100	75
Brand-Rex	CMP-00025/4F	4	100	71-72
CommScope	4504	4	100	68
CommScope	45N4	4	100	66

Manufacturer	Part No.	Category	Impedance (•)	NVP (%)
AT&T	1061	5	100	70
AT&T	2061	5	100	75
Belden	1583A/B	5	100	72
Belden	1585A/B	5	100	75
Berk-Tek	HYPER-Grade PL	5	100	72
Berk-Tek	HYPER-Grade NP	5	100	69
Berk-Tek	LANmark PL	5	100	72
Berk-Tek	LANmark NP	5	100	70

APPENDIX C. SPECIFICATIONS

GENERAL

LANcat – Main Unit:
Display: 128 x 64 pixel backlit graphic LCD
Operating Controls: 10 position rotary function selector
Elastomeric keypad
Audible Alarm: Operator Enabled/Disabled
Size: 9.6 in X 3.9 in X 2.5 in (24.8 cm X 9.9 cm X 6.35 cm)
Weight: 1 lb 15 oz (0.88 kg)

OneWay Remote Unit:
Display: Three LED indicators
Size: 6 in X 3.5 in X 1.9 in (15.2 cm X 8.9 cm X 4.8 cm)
Weight: 13 oz (0.37 kg)

ENVIRONMENTAL

Operating Temperature: 0 to 50°C (32 to 122°F)
Operating Humidity (non-condensing): 10% to 90%
Storage Temperature: -20 to +60°C (-4 to 140°F)

European Community Notice:
This device complies with Directive 89/336/EEC per TCF CC/KID/048/98.

PROTECTION

Performance Module inputs withstand telco ring voltages; 175V peak, 20-60 Hz superimposed on 56 VDC, maximum. They also withstand electrostatic discharges per IEC 801-2 severity level 4 (8KV contact).

POWER

LANcat – Main Unit:
Battery: Eight AA alkaline or NiMH rechargeable battery pack.
Battery Life: 8-10 hours continuous use or >800 Autotests (typical)
Low Battery Indicator: Audible alarm plus LCD display
Automatic Power down: 2 to 30 minutes (selectable) or disabled
AC/Mains adapter (Battery Eliminator): 12-15 Vdc, 300 mA
Lithium Coin Cell (Autotest results storage) life: 2 years

OneWay Remote Unit
Battery: Four AA alkaline
Battery Life: 8 - 10 hours continuous use or > 800 Autotests (typical)

PERFORMANCE MODULES

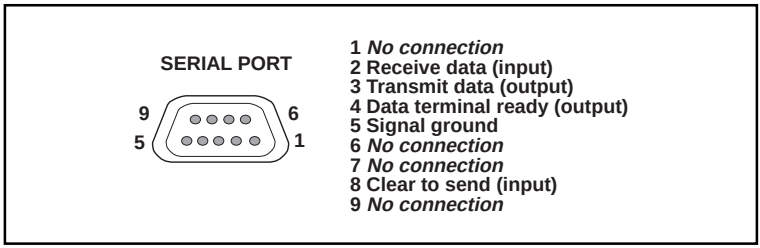
Standard: Modular Plug
Optional: Modular Jack
Optional: Coax
Optional: Optical Power Meter

MEMORY

Test Storage: Storage for 500 Autotest results plus one Traffic Report in each handheld unit. (1000 reports total in TwoWay System.)
Imprint: Date on all tests
Non-Volatile Memory: Lithium battery-backed memory for setup, test results and NVP values

SERIAL PORT

Connector: DB-9P (pins)
SERIAL PORT pin assignments:



Baud rate: 1200 to 38,400 baud. Selectable
Format: 8-bit, no parity, 1 stop bit, (8N1)
Flow Control: XON/OFF, Hardware (CTS/DTR), None
PC Cable: Null-Modem, DB-9S (socket) to DB-9S (socket) and DB-25S

CABLE LENGTH (TWISTED PAIR)

Range: 0-2000ft (0 - 610m)

Accuracy:
±2ft (0.6m) ± 2% ± NVP Uncertainty 0 to 1000 ft (0-305m)
±2ft (0.6m) ± 3% ± NVP Uncertainty 1001 to 2000 ft (306-610m)

NVP (Nominal Velocity of Propagation): 0.50c to 0.99c
Cable Fault Types: Shorts, Opens, Intermediate Impedance Anomalies
Number Of Faults: End Of Cable and two Intermediate Anomalies
Fault Threshold: User defined, 4% to 10% (7% default)

WIRE MAPPING (TWISTED PAIR WIRING ONLY)

Displays Following Errors:
Miswired Pairs, Shorts, Opens, Shorted Pairs, Crossed Pairs and Split Pairs. Includes test of shield (if present)

NEAR-END CROSSTALK (NEXT) AND ATTENUATION

- Tests NEXT for all six pair combinations
- Tests NEXT at both ends (LANcat TwoWay)
- Tests Attenuation of all four pairs one way

Frequency Range: 1 MHz to 100 MHz

NEXT Accuracy: With Modular plug Performance Module, exceeds requirements of TIA TSB-67 for Level II Accuracy.

Attenuation Accuracy: With Modular Plug Performance Module, exceeds requirements for TIA TSB-67 for Level II Accuracy.

POWER SUM NEXT

- Tests Power Sum NEXT for all four pairs
- Tests Power Sum NEXT at both ends (LANcat TwoWay)

Frequency Range: 1 MHz to 100 MHz
Test Limit: Applicable pair-to-pair NEXT limit

ATTENUATION-TO-CROSSTALK RATIO

ACR is calculated for each pair over the full frequency range per test specification selected

IMPULSE NOISE

Counts impulse noise hits above user defined threshold
Threshold: User defined, 100 mV to 500 mV peak (260 mV default)

CABLE RESISTANCE (TWISTED PAIR)

Range: 0 Ω to 1000 Ω
Accuracy: ± 0.5 Ω (0 to 10 Ω)
± 1.0 Ω (10 to 20 Ω)

CABLE IMPEDANCE (TWISTED PAIR)

Range: 30 Ω to 200 Ω
Accuracy: ± 10 Ω at 100 Ω calibration point

TRAFFIC (ETHERNET ONLY)

Parameters Monitored:
% Utilization
% Collisions
Peak Traffic
Other Features: Continuous bar graph to display activity

APPENDIX D. CABLE REPLACEMENT PROCEDURE

General

The Modular Plug Performance Module shipped with your LANcat tester features a user-replaceable test cord. This Performance Module is a critical part of a LANcat Series Cable Tester. The LANcat instrument uses frequencies up to 100 MHz where 1 inch of wire is a significant part of a wavelength. Proper wire preparation and pair twisting is extremely important to preserve measurement accuracy. Follow the procedures carefully including re-calibration and testing to maintain the superb accuracy of your LANcat Series Cable Tester.

Equipment

Cable Required

Preferred: Pre-tested replacement cable available from Datacom Textron (see Table 1). These cables have been tested for Near End Cross Talk and other critical parameters and have had wire ends prepared for direct installation.

OR: EIA/TIA T568A Category 5 patch cord, 8 ft length, cut in two.

OR: 4 ft Category 5 patch cord, with one connector removed.

Tools Required

Tie wrap - approximately 0.14 inch wide x 3 inch minimum length (3.6mm x 7.5 cm)

Screwdriver - flat blade 0.10 inch (2.5 mm)

Side cut pliers (dikes)

Wire stripping tool

Knife

Optional equipment

Soldering tools

Needle nose pliers

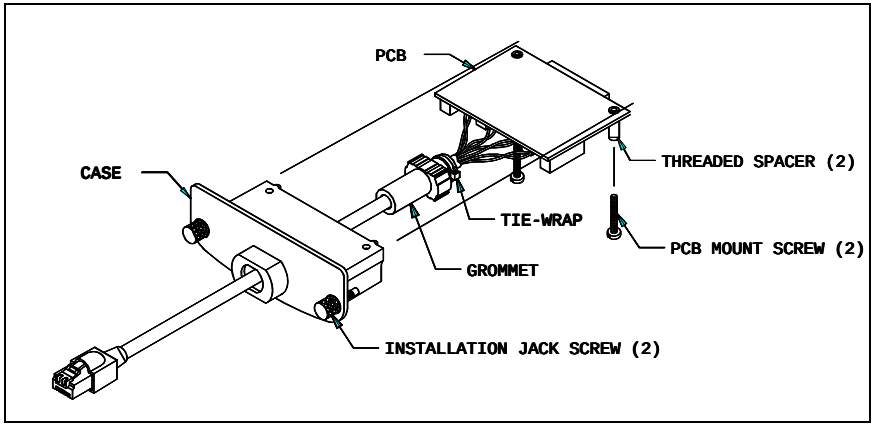


Figure D-1. Performance Module Disassembly

Disassembly

1. Remove the Performance Module from the main body (see Chapter 1, Introduction).

> **CAUTION**
> Performance Module removal exposes STATIC SENSITIVE electronics inside the main body. Ground yourself appropriately to avoid damage.

For the following, refer to Figure D-1:

2. Remove the two 11/16 inch 4-40 pan head screws from the Performance Module with a flat blade screwdriver.
3. Work the grommet through the hole in the case toward the circuit board. Move the grommet and the circuit board until both are free of the case.
4. Make notation of old wire attachments, including color vs. position, number and direction of twists and approximate lay in the case.

5. Remove individual wires by unscrewing their terminals with the screwdriver. For easy re-assembly, fully open the terminal barrels, using (6) full turns.
6. Note the location of the tie wrap on the old cable and then cut away the tie wrap without cutting the grommet.
7. Remove the grommet from cable and save for reuse.

New Cable Preparation

NOTE

This procedure assumes you are using EIA/TIA T568A type patch cord. See Table 1 for other possible configurations. (If changing cable types it may be necessary to contact Customer Service for calibration assistance.) Read all instructions before starting cable preparation.

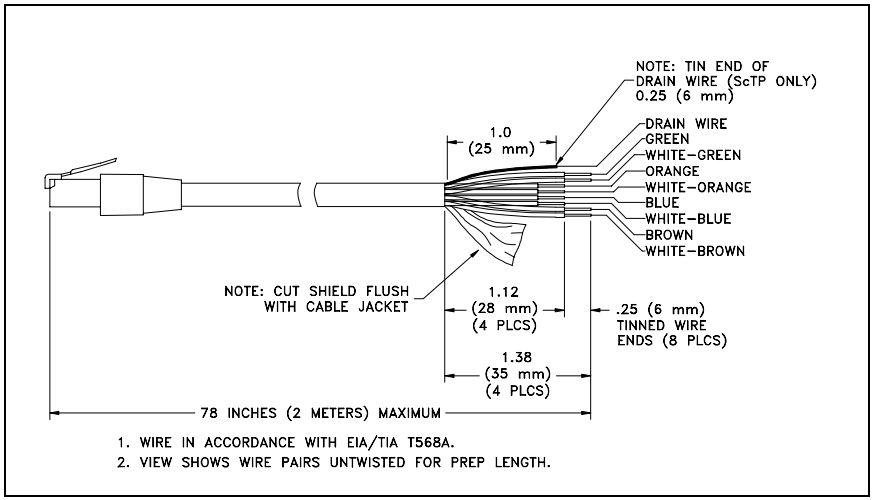


Figure D-2. Cable Preparation Per EIA/TIA T568A

1. Slide plastic case and then the grommet onto new cable.
2. Slit the jacket lengthwise 1 3/8 in (35mm). With ScTP, cut the foil shield back to the jacket, leaving the drain wire intact. Pull the jacket away and then cut it off close to the bundle.

NOTE:

Observe carefully the direction of the wire's twist. Proper installation requires this same twist direction right up to the screw terminals. When viewed from the end most wire twists clockwise as it approaches the wire's end.

3. Arrange the cable and wire pairs as shown in Figure D-2. Do not untwist the pairs any more than required to strip the wire ends.
4. Cut the two inner wire pairs (orange and blue for EIA/TIA T568A) to 1 1/8 in (28mm) from the jacket.
5. If using ScTP, cut the bare drain wire to 1 inch (25 mm).
6. Remove insulation 1/4 in (6 mm) from the end of each wire and twist to capture all strands. Optionally, tin the ends to capture all strands.
7. Re-twist each wire pair in their original direction. Use two or three full twists for the two outer pairs and one or two twists for the two inner pairs.

Reassembly

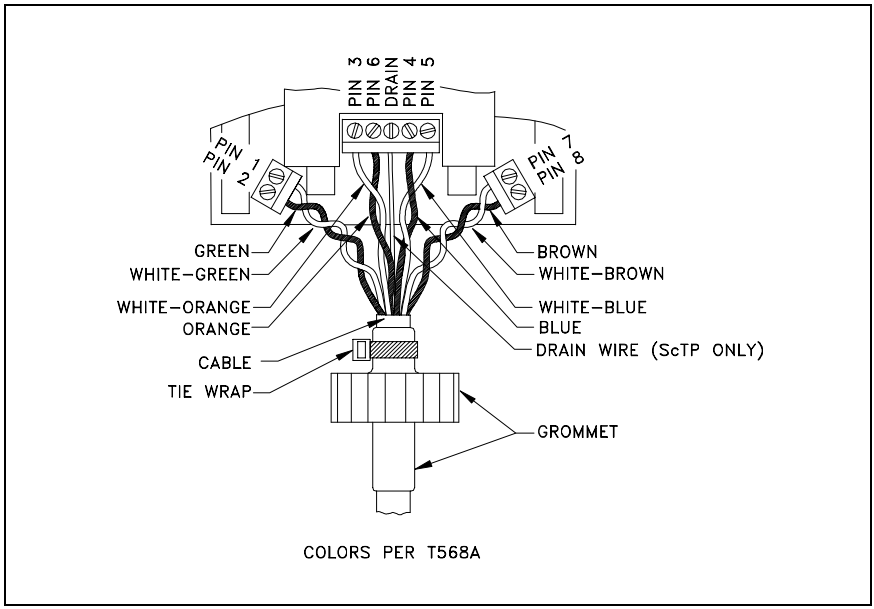


Figure D-3. UTP Cable Assembly

1. Insert **each wire** into its terminal and tighten screw until snug (see Figure D-3). If you're using ScTP, connect the drain wire to the center screw terminal of the center terminal strip.
2. Check to see that there are no stray wire strands outside terminal clamps and make sure all wires are properly tightened into their terminals.
3. Make sure that each pair twist is correct, and that the four wire pairs exit radially from the cable jacket as before. Rotate the entire cable so the fan of wires is flat and parallel to the circuit board.

4. Slide the **grommet** until 1/32 inch (0.8mm) or less of cable jacket is exposed (see Figure C-1). Rotate the grommet so that its flats are parallel with the circuit board when the fanned wires are flat to the circuit board.

   Install new **tie wrap** centered on grommet sleeve as shown in Figure D-3. When the tie wrap is finally tightened, its ratchet box should be approximately in the plane of the wire fan.

5. Tighten tie wrap as much as possible (until wrap material begins to stretch). Cut off excess tie wrap.

6. Carefully guide the grommet and circuit board into the case. Once the cylindrical neck on the grommet is through the hole, use the neck to pull the grommet into place. The twisted pairs will bunch up when properly installed. If necessary change their positions to avoid pinching.

DRAIN WIRE NOTES

CAUTION: If using ScTP, the drain wire must not short against the circuit shield nor the case (if case is copper painted). Shorten the drain wire by cutting as required to accomplish clearance.

7. Reinstall the 4-40 screws from the open side of the case (see Figure A for direction). Make sure the screws extend through the circuit board and into the plastic of the case.

8. Reinstall the Performance Module into the LANcat body by alternately turning each knurled thumb screw a small amount or turn them both simultaneously (see Chapter 1, Introduction). Only tighten these screws finger-tight.

9. Connect the remote and **run the WIREMAP test** using the Cat 5 Basic Link cable standard to make sure the new cable was installed correctly. (If the 12/36 pairs are crossed you probably

wired up a 568B cable as a 568A or visa versa. Swap the Orange and Green pairs. See Table 1.)

Recalibration

1. CALIBRATE PERFORMANCE MODULE

Follow the procedures in Chapter 9 of the LANcat Series User Manual for Performance Module Calibration.

NOTE

In addition to calibrating, this step checks the NEXT to ensure that your new cable assembly is similar in quality to Datacom Textron factory specifications. If your assembly fails this test, re-examine the twisted pairs as they enter the screw terminals. Try twisting the wires tighter and make sure the twists extend as close as possible to the screw terminals. Sometimes moving the pairs is all that is required. Many CAT 5 patch cables have too much NEXT due to the way they are terminated at the plug end. You may need to try several before finding one that passes this test. Pre-tested cables are available from your Datacom Textron Representative or directly from Datacom Textron.

2. CALIBRATE REMOTE

Follow the Remote Unit Calibration procedure, also in Chapter 9, for either a OneWay System or TwoWay System, depending on your LANcat configuration.

3. SYSTEM CHECK

Check your LANcat performance as follows:

Turn dial to EXTENDED FUNCTIONS:
Run Self Test. All results should read PASS.
Run Pair Reversal Test. Result should read PASS.

Table 1. Replacement Cable Connections

Terminal Blocks	J2		J3					J4	
Wire-Map Number	2	1	3	6	S (DRAIN)	4	5	7	8
Type	**Wire Connections**								
T568A	**Pair 3**		**Pair 2**			**Pair 1**		**Pair 4**	
UTP [1]	**Green**	**White-Green**	**White-Orange**	**Orange**		**BLue**	**White-BLue**	**White-BRown**	**BRown**
T568B *	**Pair 2**		**Pair 3**			**Pair 1**		**Pair 4**	
UTP	**Orange**	**White-Orange**	**White-Green**	**Green**		**BLue**	**White-BLue**	**White-BRown**	**BRown**
* If a T568B UTP cable is used, use the T568B wire connections.									
T568A	**Pair 3**		**Pair 2**			**Pair 1**		**Pair 4**	
ScTP [2]	**Green**	**White-Green**	**White-Orange**	**Orange**	**Drain wire**	**BLue**	**White-BLue**	**White-BRown**	**BRown**
110	**Pair 3**		**Pair 2**			**Pair 1**		**Pair 4**	
to T568A	**Green**	**White-Green**	**White-Orange**	**Orange**		**BLue**	**White-BLue**	**White-BRown**	**BRown**
110	**Pair 2**		**Pair 3**			**Pair 1**		**Pair 4**	
to T568B	**Orange**	**White-Orange**	**White-Green**	**Green**		**BLue**	**White-BLue**	**White-BRown**	**BRown**
BIX	**Pair 3**		**Pair 2**			**Pair 1**		**Pair 4**	
to T568A	**Orange**	**Blue**	**Black**	**Yellow**		**Red**	**Green**	**Brown**	**Gray**
BIX	**Pair 2**		**Pair 3**			**Pair 1**		**Pair 4**	
to T568B	**Yellow**	**Black**	**Blue**	**Orange**		**Red**	**Green**	**Brown**	**Gray**
ALL-LAN	**Pair 3**		**Pair 2**			**Pair 1**		**Pair 4**	
UTP T568A	**Green**	**White-Green**	**White-Orange**	**Orange**		**BLue**	**White-BLue**	**White-BRown**	**BRown**
ALL-LAN	**Pair 3**		**Pair 2**			**Pair 1**		**Pair 4**	
ScTP T568A	**Green**	**White-Green**	**White-Orange**	**Orange**	**Drain wire**	**BLue**	**White-BLue**	**White-BRown**	**BRown**

[1] Datacom Textron Part Number 54649

[2] Datacom Textron Part Number 54650

APPENDIX E. GLOSSARY

A

AC - Alternating Current, a voltage or current of alternating polarity.

Access Unit - A unit that allows multiple device attachment at a central location.

Address - Uniquely assigned identification code to each device or workstation connected to a network.

Analog - Continuous varying signal that can take on any voltage or current level.

Anomaly - Impedance discontinuity causing an undesired signal reflection on a transmission cable.

ANSI - American National Standards Institute.

ARCNET - Attached Resources Computing Network. A token bus developed by Datapoint.

ATM - Asynchronous Transfer Mode, a high speed packet switching method.

Attenuation - Reduction in the strength or power of a signal as it travels over the length of a cable.

Attenuation to Crosstalk Ratio (ACR) An indication of the reliability of data communications through a network. It is a computed value based upon the measured values of attenuation and NEXT.

AUI- Attachment Unit Interface, connects the transceiver and Network Interface Card in 10BASE5 networks.

AWG - American Wire Gauge, the thickness of the conductor in a cable.

B

Backbone - A central local area network used to interconnect two or more other local area networks.

Balun - A cable impedance matching RF transformer.

Bandwidth - The difference between the highest and lowest frequency available on a channel to effectively transmit signals.

Barrel Connector - Connector that joins two sections of a coax cable.

Baseband - A frequency band that uses the complete bandwidth of a cable down to zero frequency for the transmission of a single channel of data.

Basic Link - As defined by EIA/TIA TSB67, the horizontal wiring link from the work area telecommunications outlet (wallplate) to the horizontal cross-connect. Includes equipment cords at each end for connection to test instrumentation (see Appendix A, Test Standards, Figure A-2).

BER - Bit Error Rate, the ratio of received bits in error to the total received bits.

Binary - A signaling method that uses two states either a zero or one.

Bit - Binary digit, the smallest unit of data.

Bits per Second (bps) - The rate at which bits are transmitted per second.

Block - A connection system for cross connecting twisted pair telecommunication cable. Also called punch-down block. Common types include AT&T 110 and 66 blocks.

BNC - Bayonet Neil Concelman connector for coaxial cable.

Bridge - Attachment device that forwards packets from one LAN segment to another based upon destination MAC address.

Broadband - A wide bandwidth signaling method that allows a cable to simultaneously carry several different kinds of transmissions such as voice, video, and data on one cable.

Bus - A configuration in which nodes on a network are interconnected and communicate.

Byte - Eight data bits.

C

Cable - A medium that is used to interconnect two or more devices for communication.

Capacitance - The ability to store an electrical charge between two surfaces, measured in farads.

CDDI - Copper Distributed Data Interface, a variation of the FDDI standard (ANSI X3T9.5) adapted for 100 Mbps data transmission on twisted pair cable. Also called TP-PMD.

Channel - As defined by EIA/TIA TSB67, the entire horizontal wiring link connecting end devices in the work area to the hub/concentrator in the wiring closet. Includes user's equipment cords at both ends and horizontal cross-connections (see Appendix A, Test Standards, Figure A-1).

Characteristic Impedance - An inherent characteristic of the cable. A measure of resistance to AC current flow (high frequency) by a long cable.

Cheapernet - 10BASE2 or Thinnet, coax-based Ethernet network.

Coaxial (Coax) Cable - A cable that contains a single center copper conductor surrounded by insulation material and one or more layers of metal foil and/or braided wire mesh plus an outer protective jacket.

Collision - The result of two stations simultaneously attempting to transmit data on a shared network transmission medium.

Concentrator - LAN equipment that allows multiple network devices to be connected to the network cabling system through a central point. Also called a hub.

Connecting Block - Interconnecting point for several LAN segments.

Crossed Pair - Twisted pair wiring error in which a wire pair on one connector of the cable is wired to a different pair on the other end of the cable.

Crosstalk - The coupling of a signal between pairs of a multiple pair cable.

CSA - Canadian Standards Association.

CSMA/CD - Carrier Sense Multiple Access/Collision Detection. Ethernet media access method in which stations transmit on a bus whenever the medium is available and re-transmit when collisions occur.

D

DC - Direct Current. A zero frequency or constant level signal.

Decibel (dB) - A logarithmic unit of measure used to express the amplitude ratio between two signals. dB = 20 log (Vsignal2/Vsignal1).

Delay - A measure of the time electrical signals take to propagate from one end of the cable to the other end.

Delay Skew - The difference in propagation delays from one cable pair to another.

DECnet - A proprietary Ethernet LAN developed by Digital Equipment Corporation.

Differential Manchester Encoding - Digital signaling technique with a transition in the middle of the bit to provide clocking.

Drop Cable - In 10BASE5 networks, a cable connecting a workstation network interface card (NIC) with the

transmission medium. Sometimes called Attachment Unit Interface (AUI) cable.

E

EIA - Electronic Industry Association.

EMI - Electromagnetic Interference. Leakage of electro-magnetic energy outside of a transmission medium.

Ethernet - A high speed local area network using Carrier Sense Multiple Access with Collision Detection (CSMA/CD) media access method.

F

Far End Crosstalk (FEXT) - Crosstalk that is measured at the opposite end of a cable from where the signal is injected.

Fault - Accidental condition that causes a component to fail its required function.

FCC - Federal Communications Commission.

FDDI - Fiber Distributed Data Interface, a network standard (ANSI X3T9.5) that defines a 100 Mbps token ring network using optical fiber for data transmission over distances of several kilometers.

Fiber - A transmission medium designed to transmit data in the form of light pulses.

File Server - A high capacity file storage device that computers on a network can access to retrieve files.

Foil Twisted Pair (**FTP**) - See Screened Twisted Pair.

Frame - A unit of transmission in some LANs such as Token Ring.

Frequency - Rate of AC signal alternation, defined in Hertz (cycles per second).

Full Duplex - Transmission of data in both directions at the same time.

G

Gateway - A device that interconnects two or more networks that may use different protocols and media.

H

Hertz (Hz) - Unit of measure for frequency in cycles per second (cps).

Horizontal Cable - The part of a building cabling that extends from and includes the telecommunications outlet in the work area to the telecommunications (IDF) closet on the same floor.

Hub - LAN equipment that allows multiple network devices to be connected to the network cabling system through a central point. Also called a concentrator.

I

I/O - Input/Output, referring to a device input and output process.

IDF - Intermediate Distribution Frame. The distribution point where vertical backbone cable is connected to the horizontal cables.

IEEE - Institute of Electrical and Electronic Engineers.

Impedance - Frequency dependent parameter defined by the ratio of the AC Voltage to Current across a circuit element.

Impulse Noise - Non-repetitive electrical spikes or pulses caused by external electro-magnetic fields.

Inductance - The ability to store a magnetic field across a conductor measured in Henries (H).

Insulation - A non-conductive material used to isolate conductor surfaces.

Internetworking - Communication among devices across multiple networks.

ISO - International Organization for Standardization.

J

Jabber - A network fault condition where one station is continuously transmitting or transmits illegal packets of length greater than 20 msec.

Jack - EIA standard modular connector for connecting twisted pair cables at a wall plate or patch panel.

Jacket - The outside protective covering of a cable.

Jitter - The time base variation of the received data bits.

Jumper Cable - Short cable for interconnecting connecting blocks or patch panels. Also called patch cord or patch cable.

L

LAN - Local Area Network, a data communication network that provides high speed communication in a moderate size geographic area.

Link - The communications medium connecting office equipment to the hub or concentrator in the wiring closet.

Link Pulse - A single bit test pulse transmitted periodically between hubs and work stations on 10BASE-T segments to verify integrity.

Lobe - The cable segments that connect a device to the Multi-Station Access Unit, (MSAU) for Token Ring.

M

MAC - Medium Access Control, the method of determining how stations access the medium at any time.

MAC Address - A unique identification number assigned to each station connected to a network. Sometimes called Station Address.

Main Cross Connects - Provides connection between external telecommunications lines, interbuilding backbone cable, common communications equipment (PBX), and internal backbone cable. Also called Main Distribution Frame.

Main Distribution Frame (**MDF**) - See Main Cross Connects.

Medium Attachment Unit (MAU) - Device used in Ethernet networks to couple a station or hub to the transmission medium.

Medium - The physical carrier of the data being transmitted, for example twisted pair cable, coaxial cable, or fiber.

Modular Jack - EIA standard receptacle connector used for connecting twisted pair cables at a wall plate, patch panels, and station equipment. Sometimes called RJ45 jack.

Modular Plug - EIA standard connector used to terminate twisted-pair patch cables and equipment cables. Sometimes called RJ45 plug.

MSAU - Multi-Station Access Unit, a Token Ring wiring center for network attachment.

MTBF - Mean Time Between Failures, the average operation time to component failures.

N

Near End Crosstalk (NEXT) - Noise coupled between two twisted pairs measured at the same end of the cable as the disturbing signal source.

Network - A collection of nodes interconnected by a medium.

Network Interface Card (NIC) - The circuit card that interfaces a station to the network.

Network Manager - A program that is used to monitor, manage, and diagnose the problems of a network medium.

Node - Connecting point on a network. A station or device on a network.

Noise - Any random disturbance in a communications system that interferes with the integrity of the transmitted data.

NVP - Nominal Velocity of Propagation, the speed of signal propagation through a cable, expressed as a percentage of the speed of light in a vacuum.

O

Ohm - Unit of measure for resistance.

Open - A break in the connection between the two ends of a wire or cable.

OSI - Open Systems Interconnect, a seven layer architecture that serves as a model between systems.

P

Packet - A group of bits in a defined format, containing data and control information used for transmission from one node to another.

Pair - Two wires in a multi-wired cable that are used as a single transmission path.

Passive Concentrator - Type of Multi-station Access Unit (MSAU) used to connect stations to a Token Ring network without signal regeneration.

Patch Cable - A short length of cable with modular plug connectors at both ends that is used to complete a cable segment.

Patch Panel - An organized concentration of modular cable connectors that facilitates the interconnection of cable segments.

Physical Layer - The layer that provides the mechanical, electrical, and functional connection over a transmission medium.

Plenum - A air handling space inside a building. Plenum cable is certified for installation in these open spaces.

Plug - A connector designed to insert into a receptacle (jack) of a socket.

Port - An access point for data I/O.

Power Sum NEXT - A sum of the pair-to-pair NEXT coupled from all adjacent pairs in a cable.

Protocol - A standard set of rules specifying the format, timing and sequencing for data transmission.

Punch-Down Block - A block of mechanical devices that is used to connect twisted pair cable.

PVC - Polyvinyl Chloride, a standard coating used on cables.

R

Receiver - The portion of a station or node that receives the data communication.

Repeater - A device that regenerates the data signal, used to extend the network length.

Resistance - Electrical element that impedes the flow of current, measured in Ohms.

Reversed Pair - Twisted pair wiring error in which the polarity of one wire pair is reversed at one end of the link. Also called tip/ring reversal.

Ring - A LAN topology in which data is passed from station to station via a loop. Also, the designation for one conductor of a twisted-pair cable.

RJ-45 (Registered Jack) - An eight position telephone type connector.

Router - Attachment device that interconnects two or more LAN subnetowrks and relays packets based upon destination network addresses.

Runt Packet - An Ethernet packet that is shorter than the minimum (64 bytes) valid length.

S

Screened Twisted Pair (ScTP) - Cable constructed of four twisted wire pairs surrounded by a metal foil shield and an outer protective jacket. Also called Foil Twisted Pair (FTP).

Sheath - The outside covering of a cable(s).

Shield - A conductive material that is used to enclose a data cable to decrease emissions and noise susceptibility.

Shielded Twisted Pair (STP) - Cable constructed of up to four twisted wire pairs, each pair individually surrounded by a

metal foil, and all wire pairs surrounded by a metal shield plus an outer protective jacket.

Short - A near zero resistance connection between two wires of a cable.

Signal to Crosstalk (SCR) - The logarithmic ratio of the received signal to any signal that is coupled into the pair.

Signal to NEXT (SNR) - The logarithmic ratio of the received signal to the near end crosstalk that is coupled into the pair.

Signal to Noise (SNR) - The logarithmic ratio of the received signal to any noise.

Silver Satin - Flat untwisted telephone station wire. Also called quad wire.

Split Pair - Twisted pair wiring error in which pin-to-pin continuity is maintained, but physical pairs are separated.

Star - Physical layout of a LAN that uses a centralized wiring location.

Starlan - LAN network developed by AT&T.

Station - Communication device or node attached to a LAN.

STP - Shielded Twisted Pair.

System - A collection of machines and processing organized to accomplish a set of functions.

T

Tap - Connection to a coax cable that allows access to the network.

T Connection - A three-way BNC type connector used to connect coaxial cable to a station network interface card in a 10BASE2 Ethernet network.

TCP/IP - Transmission Control Protocol/Internet Protocol, a protocol originally defined by the U.S. Department of Defense.

TDR - Time Domain Reflectometry, a technique for measuring cable lengths by timing the duration between an incident pulse and the reflected pulse from an impedance discontinuity on a cable.

Telecommunications closet - A room used to interconnect horizontal cable links to communication distribution equipment. Also called wiring closet.

Terminator - A connection to the end of a cable which is intended to match the characteristic impedance of the cable.

Thicknet - 10BASE5, Ethernet.

Thinnet - 10BASE2, Ethernet. Sometimes called Cheapnet.

TIA - Telecommunications Industry Association.

Tip - One conductor of a twisted-pair cable.

Token - A sequence of bits transmitted over a Ring or Bus network used to signify permission to transmit.

TP-PMD - Twisted Pair Physical Media Dependent. A variation of the FDDI standard (ANSI X3T9.5) adapted for 100 Mbs data transmission on twisted-pair cable. Also called CDDI.

Traffic - Data transmission activity on a network.

Transceiver - A station access unit for coax networks.

Transceiver Cable - Cable used to attach a device to an Ethernet segment.

Tree - LAN topology where the cable branches from a headend.

Twinaxial Cable - A cable typically used for connecting IBM systems 36/38 and AS400 equipment. Consists of two center copper conductors surrounded by insulation material, a braided wire mesh shield and an outer protective jacket.

Twisted Pair - A transmission medium using a pair of wires that are twisted together.

U

UL - Underwriter's Laboratories.
UTP - Unshielded Twisted Pair cable. Cable constructed of four twisted wire pairs surrounded by an outer protective jacket.

V

Voice Grade Cable - A lower quality or category of cable used to carry telephone communication.
Voltage - The potential difference between two points.

W

Wide Area Networks (WAN) - Networks, usually in the public domain, that tie together widely separated computing devices or LANs.
Wiring Closet - A room used to interconnect horizontal cable links and locate communication distribution equipment. Also called telecommunications closet.
Word - Data bits assembled in a convenient processing size.
Workstation - A user's computer that can be connected to a network.

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